

Final Revision on Unit

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Definitions (or scientific terms) :

1. Matter :	- It is anything that has a mass and a volume. - It is anything that has a mass and occupies a space.
2. Mass :	It is the amount of matter that the body contains.
3. Volume :	It is the space that is occupied by the body.
4. Density :	- It is the mass of unit volume of a substance. - It is the mass of one cubic centimetre of a substance.
5. Melting process :	It is the change of matter from a solid state to a liquid state by heating.
6. Melting point :	It is the temperature at which the matter begins to change from the solid state to the liquid state.
7. Vaporization process :	It is the change of matter from a liquid state to a gaseous state by heating.
8. Boiling point :	It is the temperature at which the matter begins to change from the liquid state to the gaseous state.
9. Molecule :	It is the smallest part of matter which can exist freely and it has the properties of matter.
10. Intermolecular spaces :	The spaces that are found among the molecules of matter.
11. Intermolecular force :	The force that binds the molecules of matter together.
12. Element :	It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.
13. Compound :	It is a substance which is formed from combination of atoms of two or more different elements with constant weight ratios.
14. The atom :	- It is the fundamental building unit of matter. - It is the smallest individual unit of matter which can share in chemical reactions.
15. Atomic number :	- It is the number of protons in the nucleus of an atom. - It is the number of electrons that rotate around the nucleus.
16. Mass number :	It is the sum of the numbers of protons and neutrons in the nucleus of an atom.
17. Energy levels :	They are imaginary regions (places) around the nucleus in which the electrons move according to their energies.

PART

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18. Quantum :	It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.
19. Excited atom :	It is the atom that gains a quantum of energy.

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What is meant by ... ?

1. The density of natural milk = 1.03 gm/cm^3 :	The mass of one cubic centimetre (1cm^3) of natural milk is 1.03 gm.
2. The density of water = 1 gm/cm^3 :	The mass of one cubic centimetre (1cm^3) of water is 1 gm.
3. The melting point of ice = 0°C :	The ice begins to change into water at 0°C .
4. The boiling point of water = 100°C :	The water begins to change into water vapour at 100°C .
5. The atomic number of lithium atom is 3 :	The number of protons inside the nucleus of lithium atom equals 3
6. The mass number of oxygen atom is 16 :	The sum of the numbers of protons and neutrons in the nucleus of oxygen atom equals 16

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Importance and uses :

1. Density :	<ul style="list-style-type: none"> - It is used in determination of purity of some substances. - It is used in determination of the ability of substances to float or sink in water.
2. Hydrogen & helium gases :	They are used in filling celebrations balloons.
3. Silver, gold, platinum & copper-gold alloy :	They are used in making jewels.
4. Nickel-chrome alloy :	It is used in making heating coils.
5. Stainless steel or aluminium :	It is used in the manufacture of cooking pans (pots).
6. Copper :	It is used in making electric wires or cables.
7. Wood or plastic :	It is used in making the handles of cooking pans or screwdrivers.

8. Nickel , gold and silver :	They are used to cover other substances to protect them from corrosion.
9. Grease :	It is used to protect iron from rust and corrosion.
10. The chemical symbols of elements :	They are used to express element easily.
11. Electrons of the outermost energy level :	They are responsible for the chemical reactions.

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Life applications :**1. Applications on density :**

- Water is not used to put out petrol fires.
- Balloons filled with hydrogen or helium rise up in air carrying flags during festivals.
- Determination of the quality of milk.

2. Applications on melting point :

- Workmen melt the solid metals to be easy for mixing and shaping to make alloys.
- Cooking pans are made up of aluminium or stainless steel alloy which doesn't rust as they have high melting points.

3. Application on boiling point :

- The separation of the components of petroleum oil depends on the difference between them in their boiling points.

4. Applications on hardness :

- The screwdrivers are made up of steel iron.
- The rods used in building houses' concrete are made up of iron.

5. Applications on electric conduction :

- Electric wires or cables are made up of copper or aluminium and they are covered by a plastic layer.
- Electric screwdrivers are made up of steel iron, while their handles are made up of wood or plastic.

6. Applications on thermal conduction :

- Cooking pans are made up of aluminium or stainless steel alloy which doesn't rust.
- Handles of cooking pans are made up of wood or plastic.

7. Applications on chemical activity of metals :**A. Application on very active metals :**

- Sodium and potassium are kept under kerosene surface.

B. Applications on less active metals :

- Steel bridges and the holders of light bulbs are painted from time to time.
- Metallic spare parts of cars are covered with grease.
- Washing cooking pans which are made up of aluminium with a rough material.

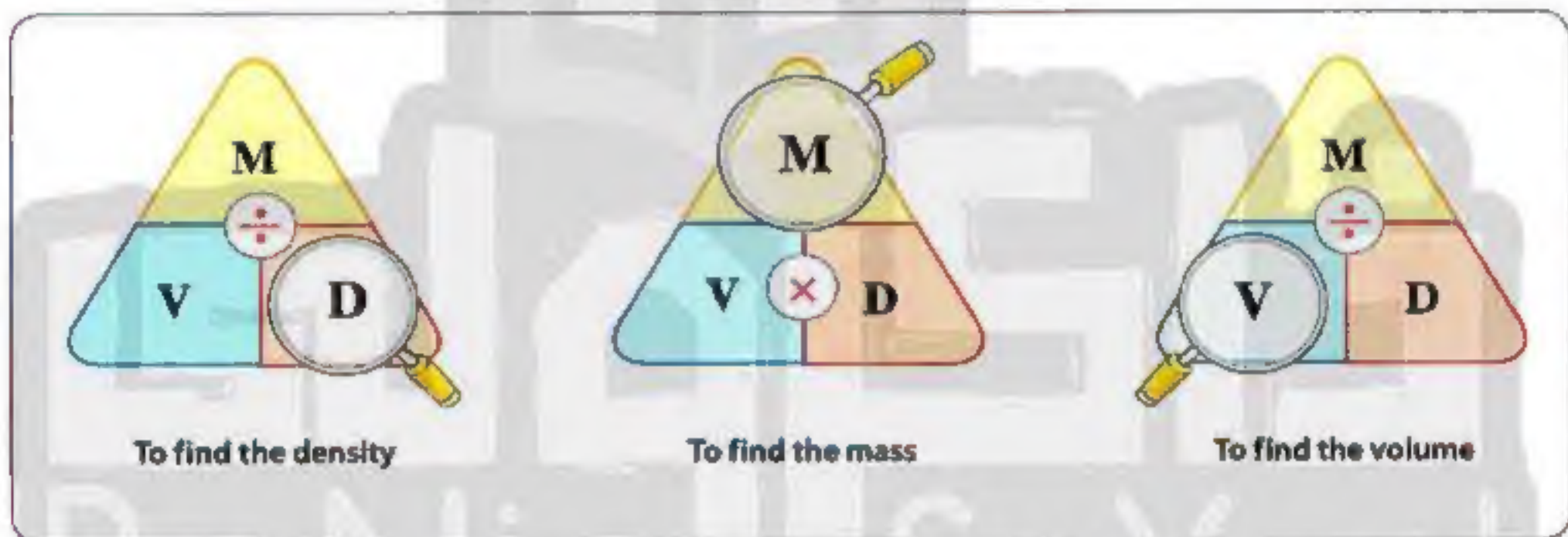
C. Applications on inactive metals :

- Silver, gold and platinum are used in making jewels.
- Nickel, gold and silver are used to cover other substances which rapidly gain rust.

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Laws and solved problems :

$$1 \text{ Density (D)} = \frac{\text{Mass (M)}}{\text{Volume (V)}} \longrightarrow \text{gm/cm}^3 = \frac{\text{gm}}{\text{cm}^3}$$



Problem 1 Calculate the mass of a piece of sulphur, whose volume is 5 cm^3 , knowing that the density of sulphur is 2.1 gm/cm^3 .

Solution

$$M = V \times D = 5 \times 2.1 = 10.5 \text{ gm.}$$

Problem 2 If you have two cubes (A) & (B) of wood, whose density is 0.5 gm/cm^3 . Calculate :

- The mass of cube (A) knowing that its volume is 50 cm^3
- The volume of cube (B) knowing that its mass is 10 gm .

Solution

$$\text{a. The mass of cube A (M)} = D \times V = 0.5 \times 50 = 25 \text{ gm.}$$

$$\text{b. The volume of cube B (V)} = \frac{M}{D} = \frac{10}{0.5} = 20 \text{ cm}^3$$

Problem 3 In an experiment for determining the density of water, the following results are recorded.

- The mass of an empty beaker = 65 gm.
- The mass of the beaker and water = 165 gm.
- The volume of water = 100 cm³

Calculate the density of water.

Solution

The mass of water = The mass of the beaker and water - The mass of the empty beaker = 165 - 65 = 100 gm.

The density of water (D) = $\frac{M}{V} = \frac{100}{100} = 1 \text{ gm/cm}^3$

Problem 4 On determining iron density using a piece of iron of mass is 78 gm, the piece is immersed in 100 cm³ of water, the water increases up to 110 cm³. Find the density of iron.

Solution

The volume of the iron piece =

The volume of water and the iron piece - The volume of water = 110 - 100 = 10 cm³

The density of the iron piece (D) = $\frac{M}{V} = \frac{78}{10} = 7.8 \text{ gm/cm}^3$

- Atomic no. = No. of protons = No. of electrons.
• Mass no. = No. of protons (Atomic no.) + No. of neutrons.
∴ Number of neutrons = Mass number - Atomic number.
- The number of electrons which saturates the first four energy levels can be calculated from the relation (2n²), where (n) is the number of the energy level.

This rule is applied only on the first four energy levels [K, L, M and N].

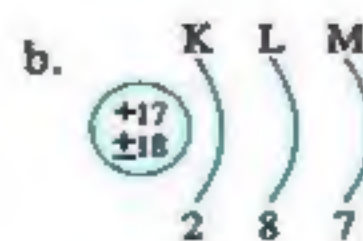
- No. of electrons which saturates the (K) level = 2 × (1)² = 2 electrons.
- No. of electrons which saturates the (L) level = 2 × (2)² = 8 electrons.
- No. of electrons which saturates the (M) level = 2 × (3)² = 18 electrons.
- No. of electrons which saturates the (N) level = 2 × (4)² = 32 electrons.

Problem If you are given the symbol of chlorine atom is (³⁵₁₇Cl).

- Calculate the atomic number, mass number and number of neutrons.
- Write the electronic configuration of the atom.

Solution

- Atomic number = 17
• Mass number = 35
• Number of neutrons = 18







Important tables :

1 Physical properties which are used to distinguish between substances and each others :

Physical property	Used to distinguish between
• Colour :	Gold, iron and silver.
• Taste :	Sugar, table salt and flour.
• Odour (Smell) :	Perfume and vinegar.
• Density :	<ul style="list-style-type: none"> - Substances float on water surface as their densities are less than the density of water. As : Ice, cork and wood. - Substances sink in water as their densities are more than the density of water. As : Iron, metallic coin and copper.
• Melting point :	<ul style="list-style-type: none"> - Substances have low melting points. As : Wax, butter and ice. - Substances have high melting points. As : Iron, copper, aluminium and table salt.
• Boiling point :	Components of petroleum oil and separation of them from each other.
• Hardness :	<ul style="list-style-type: none"> - Rubber is soft at room temperature. - Metals are soft by heating. - Coal and sulphur don't soft by heating.
• Electric conduction :	<ul style="list-style-type: none"> - Good conductors of electricity. As : Acidic solutions, alkaline solutions, some salt solutions and metals as iron, silver, copper, - Bad conductors of electricity. As : Gases, sugary solution, solution of hydrogen chloride in benzene, sulphur, phosphorus, wood and plastic.
• Thermal conduction :	<ul style="list-style-type: none"> - Good conductors of heat. As : Copper, iron, aluminium, - Bad conductors of heat. As : Wood and plastic.

2 Molecules of some elements and compounds :

Molecule	Its kind	No. and type of atoms	Illustrating figure
1. Oxygen molecule :	Element molecule	Two similar atoms (two oxygen atoms).	
2. Hydrogen chloride molecule :	Compound molecule	Two different atoms (one hydrogen atom & one chlorine atom).	
3. Water molecule :	Compound molecule	Three atoms of two different elements (two hydrogen atoms & one oxygen atom).	
4. Ammonia molecule :	Compound molecule	Four atoms of two different elements (three hydrogen atoms & one nitrogen atom).	

3 The chemical symbols of some elements :

Element	Symbol	Element	Symbol
Hydrogen	H	Chlorine	Cl
Helium	He	Argon	Ar
Lithium	Li	Potassium	K
Carbon	C	Calcium	Ca
Nitrogen	N	Iron	Fe
Oxygen	O	Copper	Cu
Fluorine	F	Zinc	Zn
Neon	Ne	Bromine	Br
Sodium	Na	Silver	Ag
Magnesium	Mg	Iodine	I
Aluminium	Al	Gold	Au
Silicon	Si	Mercury	Hg
Phosphorus	P	Lead	Pb
Sulphur	S		

4 The electronic configuration of some atoms and chemical activity :

Atom of element	Atomic number	Mass number	No. of neutrons	No. of protons (or electrons)	Electronic configuration	Chemical activity
1. Hydrogen (${}^1_1\text{H}$) :	1	1	zero	1	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; margin-right: 10px;">1p</div> <div style="text-align: center;"> K $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 1 </div> </div>	Active
2. Helium (${}^4_2\text{He}$) :	2	4	2	2	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; margin-right: 10px;">2p 2n</div> <div style="text-align: center;"> K $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 2 </div> </div>	Inactive (Inert gas)
3. Nitrogen (${}^{14}_7\text{N}$) :	7	14	7	7	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; margin-right: 10px;">7p 7n</div> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; gap: 10px;"> <div style="text-align: center;"> K $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 2 </div> <div style="text-align: center;"> L $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 5 </div> </div> </div> </div>	Active
4. Sodium (${}^{23}_{11}\text{Na}$) :	11	23	12	11	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; margin-right: 10px;">11p 12n</div> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; gap: 10px;"> <div style="text-align: center;"> K $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 2 </div> <div style="text-align: center;"> L $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 8 </div> <div style="text-align: center;"> M $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 1 </div> </div> </div> </div>	Active
5. Chlorine (${}^{35}_{17}\text{Cl}$) :	17	35	18	17	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; margin-right: 10px;">17p 18n</div> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; gap: 10px;"> <div style="text-align: center;"> K $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 2 </div> <div style="text-align: center;"> L $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 8 </div> <div style="text-align: center;"> M $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 7 </div> </div> </div> </div>	Active
6. Argon (${}^{40}_{18}\text{Ar}$) :	18	40	22	18	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; margin-right: 10px;">18p 22n</div> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; gap: 10px;"> <div style="text-align: center;"> K $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 2 </div> <div style="text-align: center;"> L $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 8 </div> <div style="text-align: center;"> M $\left. \begin{array}{c} \text{ } \end{array} \right\}$ 8 </div> </div> </div> </div>	Inactive (Inert gas)

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Give reasons for :

1. Air is considered as matter.
Because air has a mass and occupies a certain space.
2. Colour, taste and odour can't be used to differentiate between water and oxygen gas.
Because both of water and oxygen gas are colourless, tasteless and odourless.
3. The mass of 1 cm^3 of iron is higher than that of 1 cm^3 of wood.
Because the density of iron is more than that of wood.
4. • Equal masses of different substances have different volumes.
• Equal volumes of different substances have different masses.
Because the difference in density.
5. A piece of wood floats on water surface, while a piece of lead sinks in it.
Because the density of wood is less than that of water, while the density of lead is more than that of water.
6. An iron nail sinks in water, while one kilogram of cork floats on its surface.
Because the density of iron is more than that of water, while the density of cork is less than that of water.
7. Ice floats on water surface, although they are different states of the same matter.
Because the density of ice is less than that of water.
8. Water isn't used to put out petrol fires.
Because the density of petrol is less than that of water so, petrol floats on water surface and water doesn't put out the petrol fires.
9. Balloons filled with hydrogen or helium rise up in the air carrying flags during festivals.
Because the densities of hydrogen and helium are less than the density of air.
10. A piece of ice changes into water after a period of time when it is left in air.
Because the melting point of ice is low.
11. Workmen melt the solid metals.
To be easy for mixing and shaping to form alloys as copper-gold alloy.
12. It's easy to shape metals, while it's difficult to shape coal.
Because metals become soft by heating, so it's easy to shape them, while coal doesn't soft by heating, so it's difficult to shape it.

13. Iron rods not copper rods are used in building concrete houses.

Because the hardness of iron is more than that of copper.

14. Electric wires (or cables) are made up of copper or aluminium and they are covered by a plastic layer.

Because copper and aluminium are good conductors of electricity, while plastic is a bad conductor of electricity.

15. An electrician uses a screwdriver made up of steel iron with a plastic handle.

Because steel iron is very hard and a good conductor of electricity, while plastic is a bad conductor of electricity.

16. Cooking pans are made up of aluminium or stainless steel alloy which doesn't rust.

Because they are good conductors of heat and they have high melting point.

17. Handles of cooking pans are made up of wood or plastic.

Because each of them is a bad conductor of heat.

18. Active metals such as sodium lose their metallic luster when they are exposed to moist air.

Because they react easily with atmospheric oxygen.

19. Potassium and sodium are kept under kerosene surface.

To prevent their reaction with atmospheric oxygen as they are active metals.

20. • Steel bridges and the holders of light bulbs are painted from time to time.

• Metallic spare parts of cars are covered with grease.

• Some metallic pitchers are covered with a layer of silver.

To protect them from rust and corrosion.

21. Cooking pans made up of aluminium are washed with a rough material.

To remove the rust layer formed on their surfaces.

22. Silver, gold and platinum are used in making jewels.

Because they are chemically poor active.

23. The odour of perfume spreads all over the room when the bottle is opened.

Because the molecules of the perfume are in a continuous motion and they keep the properties of the perfume.

24. • A drop of ink spreads through water.

• When we put a small amount of potassium permanganate in a glass containing water, the colour of water changes into violet.

Because the molecules of ink or potassium permanganate are in a continuous motion in all directions among water molecules.

25. • Disappearance of a little amount of table salt when it is put in a beaker containing water for a period of time.

• Disappearance of sugar when it is dissolved in water.

Because molecules of table salt or sugar spread in the intermolecular spaces among water molecules.

26. • The volume of a mixture of water and alcohol is less than the sum of their volumes before mixing.

• On adding 300 cm^3 of water to 200 cm^3 of alcohol, it was found that their volumes together became less than 500 cm^3 .

Because some molecules of alcohol occupy the intermolecular spaces among water molecules.

27. It is difficult to break down a piece of iron with your hand.

Because there are strong attraction forces among iron molecules.

28. It is easy to divide an amount of water into smaller parts.

Because there are weak attraction forces among water molecules.

29. Solid substances have definite shape and volume.

Because the intermolecular spaces among their molecules are very narrow and the intermolecular force is very strong, so the molecules are relatively fixed in their positions.

30. The liquid matter takes the shape of its container.

Because the intermolecular spaces among its molecules are relatively large and the intermolecular force among its molecules is weak.

31. Gases have indefinite shapes and volumes.

Because the intermolecular spaces among their molecules are very large and the intermolecular force among their molecules is very weak.

32. The matter changes from solid state to liquid state by heating.

Because by heating, solid molecules gain thermal energy, so their speed increases and at the melting point, the intermolecular forces weaken, so the intermolecular spaces increase and they become more freely leading to the change of matter from the solid state into the liquid state.

33. • The matter changes from liquid state into gaseous state by heating.

• When water gains energy, it converts into gas.

Because when a liquid substance is heated, its molecules gain more energy and their speed increases and at the boiling point, the molecules overcome the intermolecular forces and the intermolecular spaces increase, so they escape in the form of vapour.

34. Molecules of elements differ from molecules of compounds.

Because molecule of an element consists of similar atoms, but molecule of a compound consists of different atoms.

35. Oxygen is an element, while hydrogen chloride is a compound.

Because oxygen molecule is formed of two similar atoms, while hydrogen chloride molecule is formed of two different atoms.

36. The molecule of helium differs from the molecule of hydrogen.

Because helium is an inert gas and its molecule is monoatomic, while hydrogen is active gas and its molecule is diatomic.

37. The properties of molecules of substances are different from each other.

Because molecules of various substances differ from each other in :

- a. number of atoms.
- b. kind of atoms.
- c. way of combination between atoms.

38. Carbon is symbolized by one letter, while calcium is symbolized by two letters.

Because the name of each of them starts with letter (C) so, (C) is chosen as the symbol of carbon and (Ca) is the symbol of calcium.

39. The symbol of sodium is (Na) not (So) as it is expected.

Because the symbol is derived from Latin name not from English language.

40. The atom is electrically neutral.

Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

41. The mass of the atom is concentrated in the nucleus.

Because the electron has a negligible mass relative to that of the proton or neutron.

42. The nucleus has a positive charge.

Because it contains protons which are positively charged and neutrons which are electrically neutral.

43. The mass number is usually greater than the atomic number.

Because the mass number is the sum of numbers of protons and neutrons inside the nucleus, while atomic number equals the number of protons only.

44. In hydrogen atom, the atomic number equals the mass number.

Because hydrogen atom doesn't contain neutrons, so the mass number = the atomic number = the number of protons.

Final Revision

45. The electrons are distributed to fill (K) level before filling (L) level.

Because the energy of (K) level is less than that of (L) level.

46. • The energy level (M) in the atom isn't occupied by more than 18 electrons.

• The third energy level in the atom is saturated by 18 electrons.

Because the energy levels are saturated with electrons according to the relation $(2n^2)$, so the number of electrons in this level $= 2 \times (3)^2 = 18$ electrons.

47. The rule $(2n^2)$ is not applied on the energy levels greater than four.

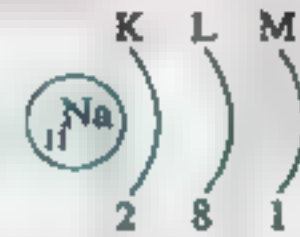
Because the atom becomes unstable if the level contains more than 32 electrons.

48. The number of electrons in the outermost energy level determines the chemical activity of the element.

Because if the outermost energy level contains 8 electrons, so the element is inactive (inert), while if the outermost energy level contains less than 8 electrons, so the element is active.

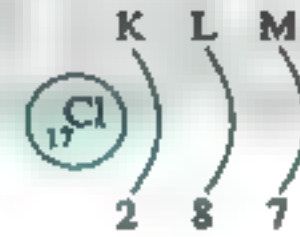
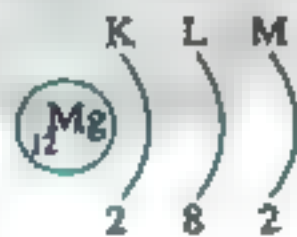
49. The number of electrons in the outermost energy level in lithium atom (${}^7_3\text{Li}$) is equal to that of sodium atom (${}^{23}_{11}\text{Na}$).

Because both of them have one electron in the outermost energy level.



50. The electrons of (${}^{24}_{12}\text{Mg}$) and (${}^{35}_{17}\text{Cl}$) are distributed in the same number of energy levels.

Because both of them have three energy levels.



51. Atoms of active elements take part in the chemical reaction.

To form stable molecules.

52. • Inert gases can't share in chemical reactions in ordinary state.

• The atoms of inert gases are stable.

Due to filling of their outermost energy levels with electrons.

53. Neon atom (${}^{20}_{10}\text{Ne}$) doesn't take part in the chemical reaction, while nitrogen atom (${}^{14}_7\text{N}$) takes part in the chemical reaction.

Because in (${}^{20}_{10}\text{Ne}$) atom, the outermost energy level is saturated with 8 electrons, while the outermost energy level in (${}^{14}_7\text{N}$) atom contains 5 electrons.

54. Sodium atom is active , while argon is inactive.

Because the outermost energy level of sodium atom is not completely filled with electrons (contains one electron), while the outermost energy level of argon atom is completely filled with electrons (contains 8 electrons).

8

What happens when?

1. • Increasing the mass of a body to double, according to its density.
• Decreasing the volume of a body to half, according to its density.

The density remains constant.

2. Putting of a piece of cork and a metallic coin in water.

The piece of cork floats on water surface, while the metallic coin sinks in it.

3. Using of water in putting out petrol fires.

The petrol floats on water surface, so the fires don't put out.

4. Heating of a piece of coal.

It doesn't melt by heating.

5. Iron nail moisten by water is exposed to air for several days and why ?

It rusts due to its reaction with atmospheric oxygen.

6. Leaving steel bridges and the holders of light bulbs without paint.

They will rust and corrode.

7. Leaving of some metals exposed to air for a long time and why ?

Their luster disappears due to their reaction with atmospheric oxygen.

8. Opening of a perfume bottle in a closed room for a while.

The odour of the perfume spreads all over the room.

9. Putting of some table salt in a beaker containing water.

The molecules of table salt spreads through the intermolecular spaces among water molecules.

10. Putting of a drop of ink in water.

The colour of ink spreads through all the water.

11. You add 50 cm^3 of ethyl alcohol to 100 cm^3 of water.

The volume of the mixture will be less than 150 cm^3

12. You try to break a piece of iron with your hand.

You can't break the iron piece.

13. Heating of a piece of solid matter for a long time.

Its molecules gain thermal energy, so their speed increases and at the melting point, the intermolecular force weaken, so the intermolecular spaces increase, and they become more freely leading to the change of matter from the solid state into liquid state.

14. Heating of some water in a beaker to its boiling point.

Its molecules gain more energy and their speed increases and at the boiling point some of them overcome the intermolecular forces and the intermolecular spaces increase, so they escape in the form of vapour.

15. Three atoms of hydrogen combine with one atom of nitrogen.

Ammonia molecule is formed.

16. The nucleus of an atom of an element doesn't contain neutrons.

The atomic number is equal to its mass number.

17. The number of protons changes.

The value of the positive charge changes, and the value of the atomic number and mass number change so, the element changes into another element.

18. • The electron gains a quantum of energy.

- The energy of the electron becomes more than the energy of the level in which the electron rotates.
- The electron gains some energy which equals to the difference between the energies of two levels.

It transfers to a higher level and the atom becomes excited atom.

19. An excited electron loses a quantum of energy.

The electron returns back to its original level and the atom returns to its ground state.

20. The outermost energy level of an atom isn't completely filled with electrons.

The atom will react chemically with another atom or more than one atom to produce a molecule in a stable state.

Comparisons

1 Iron and wax :

Points of comparison	Iron	Wax
• Density related to water :	More than the density of water.	Less than the density of water.
• Melting point :	High.	Low.

2 Copper and plastic :

Points of comparison	Copper	Plastic
• Electric conduction :	Good conductor of electricity.	Bad conductor of electricity.
• Thermal conduction :	Good conductor of heat.	Bad conductor of heat.

3 Rubber, aluminium and sulphur :

Points of comparison	Rubber	Aluminium	Sulphur
• Hardness :	Soft at room temperature.	Soft by heating.	Doesn't soft by heating.
• Electric conduction :	Bad conductor of electricity.	Good conductor of electricity.	Bad conductor of electricity.

4 Very active metals, less active metals and inactive metals :

Points of comparison	Very active metals	Less active metals	Inactive metals
• Chemical activity :	They are metals which react with oxygen as soon as being exposed to humid air.	They are metals which react with oxygen if they are left in air for some days forming a layer of rust.	They are metals which find great difficulty in reacting with oxygen.
• Examples :	Sodium and potassium.	- Iron, aluminium and copper.	Gold, silver, platinum, nickel and chromium.

5 Melting process and vaporization process :

Points of comparison	Melting process	Vaporization process
• Definition :	It is the change of matter from a solid state to a liquid state by heating.	It is the change of matter from a liquid state to a gaseous state by heating.
• Example :	The change of ice into water.	The change of water into water vapour.

Final Revision

6 The three states of matter :

Points of comparison	The solid state	The liquid state	The gaseous state
• Motion of molecules :	Limited motion (vibrational motion).	More free (intermediate).	Completely free (unlimited).
• Intermolecular spaces :	Very small (narrow).	Intermediate (relatively large).	Very large.
• Intermolecular forces :	Very strong.	Intermediate (relatively weak).	Very weak (vanishing) or almost not existed.
• Volume :	Definite (fixed).	Definite	Indefinite (variable).
• Shape :	Definite.	Indefinite.	Indefinite.
• Examples :	• Ice. • Iron. • Aluminium.	• Water. • Alcohol. • Oil.	• Water vapour. • Oxygen. • Carbon dioxide.

7 Element and compound :

Points of comparison	Element	Compound
• Definition :	It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.	It is a substance which is formed from combination of atoms of two or more different elements with constant weight ratios.
• Atoms :	Similar.	Different.
• Examples :	Hydrogen, oxygen, aluminium and sulphur.	Water, carbon dioxide, hydrogen chloride and ammonia.

8 Bromine and mercury :

Bromine	Mercury
A liquid nonmetal element.	A liquid metal element.
Its molecule consists of two atoms.	Its molecule consists of one atom.

9 Sodium, bromine and neon :

Points of comparison	Sodium	Bromine	Neon
• Chemical activity :	Active	Active	Inactive (inert gas)
• Physical state :	Solid	Liquid	Gas
• Number of atoms of the molecule :	One atom	Two atoms	One atom

10 Water molecule and ammonia molecule :

Points of comparison	Water molecule	Ammonia molecule
• The type of the molecule :	It is a compound molecule.	It is a compound molecule.
• The structure of the molecule :	It consists of two hydrogen atoms and one oxygen atom.	It consists of one nitrogen atom and three hydrogen atoms.
• The no. of atoms forming it :	Three atoms.	Four atoms.



11 Atomic number and mass number :

Atomic number	Mass number
It is the number of protons in the nucleus of an atom.	It is the sum of the numbers of protons and neutrons inside the nucleus of an atom.
It is written at the left side below the symbol.	It is written at the left side above the symbol.

12 Constituents of the atom :


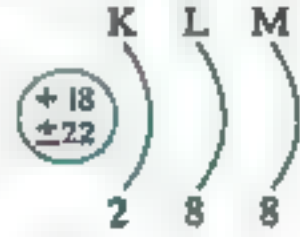
Points of comparison	Proton	Neutron	Electron
• Position :	In the nucleus.	In the nucleus.	Revolves around the nucleus
• Charge :	Positive (+)	Neutral (±)	Negative (-)
• Mass :	Very large compared to electron mass.	Very large compared to electron mass.	Very small compared with proton or neutron mass.

13 Active elements and inactive elements :

Active elements	Inactive (Inert) elements
• The outermost energy level contains less than 8 electrons.	• The outermost energy level is completely filled with 8 electrons (except He).
• Atoms of active elements (unstable) take part in chemical reactions to produce stable molecules.	• Atoms of inactive elements (stable) don't take part in chemical reactions in ordinary conditions because the outermost energy levels are completely filled with electrons.
• Example : Sodium ($^{23}_{11}\text{Na}$) 	• Example : Argon ($^{40}_{18}\text{Ar}$) 

Final Revision

14 Aluminium atom ($^{27}_{13}\text{Al}$) and argon atom ($^{40}_{18}\text{Ar}$) :

Points of comparison	Aluminium atom ($^{27}_{13}\text{Al}$)	Argon atom ($^{40}_{18}\text{Ar}$)
• Chemical activity :	Active	Inactive (Inert gas)
• Atomic no. :	13	18
• Mass no. :	27	40
• No. of protons :	13	18
• No. of neutrons :	14	22
• Electronic configuration :		
• No. of electrons in the outermost level :	3	8

10

Activities



ACTIVITY

- To distinguish between substances by density :
- To compare between the density of some substances and water :



Tools :

- A basin containing water.
- Drops of oil.
- Pieces of (ice, cork, wood, iron, and metallic coin).



Step :

Put all of the previous substances in the basin.



Observation :

Ice, cork, wood and oil float on water surface, while iron and metallic coin sink in it.



Conclusion :

1. Matter which have density higher than that of water sink in it.
2. Matter which have density lower than that of water float on its surface.

PART

2



ACTIVITY 2

To differentiate between different substances by the point of fusion (melting point) :



Steps :

1. In a hot water bath, put a beaker containing crushed ice and a thermometer.
2. Record the reading at which the ice starts to melt.
3. Replace the crushed ice by wax and repeat the previous steps.



Observation :

The melting point of ice is less than that of wax.



Conclusion :

Each substance has a definite melting point.



ACTIVITY 3

- To show that the matter is composed of molecules :
- Molecule is the building unit of matter :



Steps :

1. Put a suitable amount of perfume in a glass beaker, then determine its mass by using a sensitive balance.
2. Leave the beaker in one side of the room for a period of time, then move to the other side of the room.
3. Determine the mass of the beaker again.



Observations :

- The odour of the perfume spreads all over the room.
- The mass of the beaker decreases.



Conclusion :

The matter of the perfume is divided into smaller parts called **molecules** which keep the properties of the perfume, so the **molecule** is the building unit of matter.



The mass of the beaker of perfume at the beginning of the activity



The mass of the beaker of perfume after spreading of its particles

It is difficult to break a piece of iron, because the attraction forces among molecules are very strong in solids (such as iron), while it is easily to divide water because are weak in liquids (such as water).

Conclusion :

1. It is difficult to break the iron piece.
2. It is easily to divide the water into portions.

Observations :

1. Try to break (fragmentize) an iron piece with your fingers or by hammering it.
2. Try to divide an amount of water in small cups.

Steps :

Activity 6 To prove the presence of intermolecular forces among the molecules of matter :

There are intermolecular spaces among the molecules of matter (water), in which some molecules of alcohol spread in these intermolecular spaces.

Conclusion :

The volume of the mixture will be less than 500 cm³.

Observation :

Put 300 cm³ of water in a graduated cylinder, then add 200 cm³ of alcohol to

Step :

Activity 5 To prove the presence of intermolecular spaces among the molecules of matter :

The molecules of matter are in a state of continuous motion.

Conclusion :

The violet colour of potassium permanganate spreads through all the water.

Observation :

Put a small quantity of potassium permanganate in a glass beaker containing

Step :

Activity 4 To prove that the molecules of matter are in a state of continuous motion :

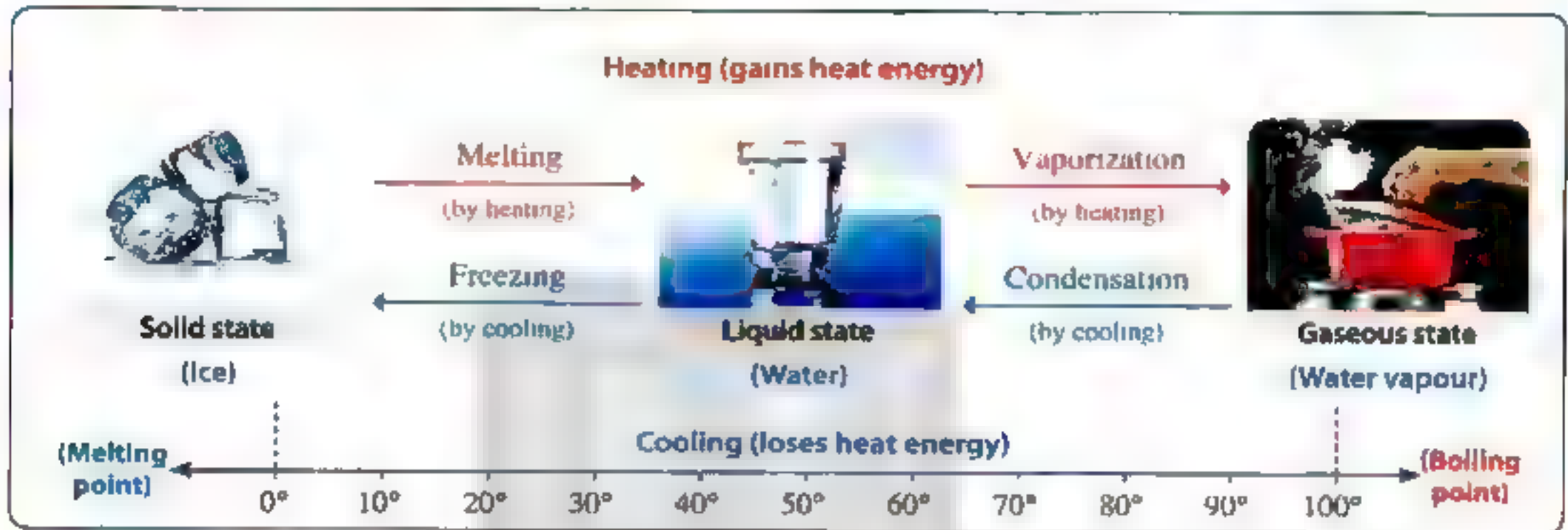
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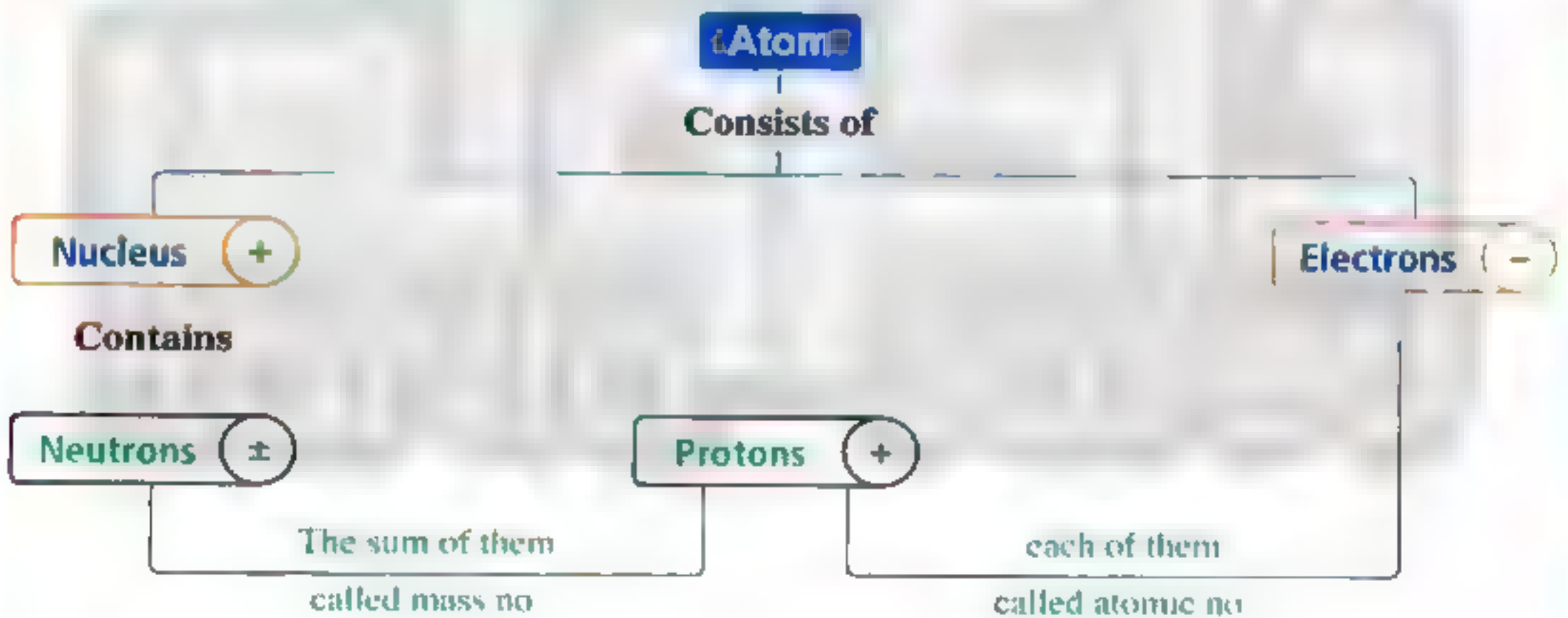
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Important diagrams

1 Diagram shows the changes of matter (water) by changing its temperature :



2 Diagram shows the atomic construction :



Final Revision on Unit

2

1

Definitions (or scientific terms)

1. Energy :	It is the ability to do work or to make a change.
2. Potential energy :	It is the stored energy in the object due to the work done on it.
3. Kinetic energy :	It is the work done during the motion of an object.
4. Mechanical energy :	It is the sum of potential and kinetic energies of the body.
5. The conservation law of energy :	Energy is neither created nor destroyed, but it is converted from one form to another.
6. Heat energy :	It is a form of energy which is transferred from the object of higher temperature to that of lower one.
7. Temperature :	It is the heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another.
8. Transfer of heat by conduction :	It is the transfer of heat through some solid objects from the part of higher temperature to the part of lower temperature.
9. Transfer of heat by convection :	It is the transfer of heat in gases and liquids, where hot molecules which have less density, rise upwards, while colder molecules which have more density fall down.
10. Transfer of heat by radiation :	It is the transfer of heat from hot object to another without any need for a material medium through which heat transfers.

2

What is meant by ...?

1. The potential energy of an object = 20 joules.	The stored energy in the object due to the work done on it is 20 joules.
2. The potential energy of an object = zero.	The object is at the ground.
3. The kinetic energy of an object = 90 joules.	The work done during the motion of the object is 90 joules.
4. The kinetic energy of an object = zero.	The object doesn't move (its speed is zero).
5. The mechanical energy of a moving body = 100 joules.	The sum of potential and kinetic energies of the body is 100 joules.

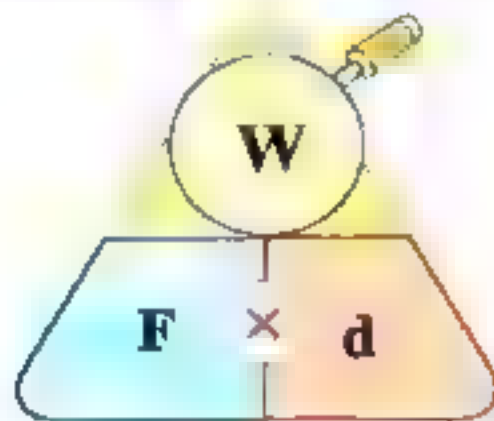
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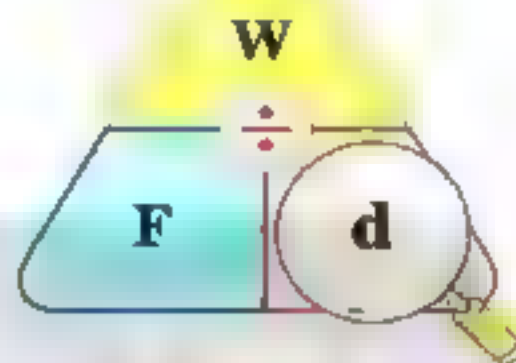
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Laws and solved problems

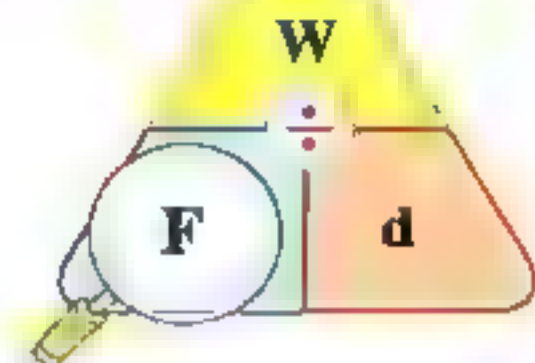
- 1 Work (W) = Force (F) × Displacement (d)
 «Joule» «Newton» «Metre»



To find the work



To find the displacement



To find the force

Problem If a force of 100 newtons acted on a body to move it a distance 3 metres in the direction of the force. Calculate the work done.

Solution

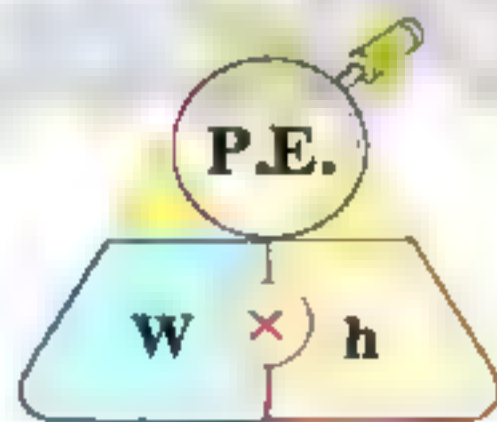
$$W = F \times d$$

$$W = 100 \times 3 = 300 \text{ joules}$$

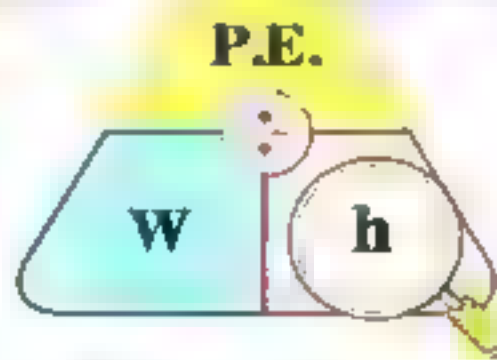
- 2 Weight (w) = Mass (m) × Acceleration due to gravity (g)
 «Newton» «kg» «m/s²»

$$\text{Potential energy (P.E.)} = \text{Weight (w)} \times \text{Height (h)}$$

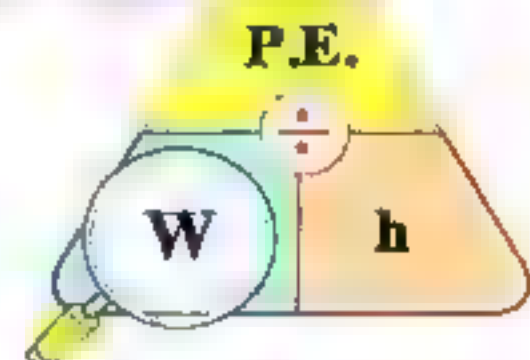
«Joule» «Newton» «m»



To find the potential energy



To find the height



To find the weight

Problem 1 Calculate the potential energy of a body, whose mass is 2.5 kg. and it is found at a height of 5 m.

Solution

$$\text{Weight} = \text{Mass} \times \text{Acceleration due to gravity} = 2.5 \times 10 = 25 \text{ N}$$

$$\text{P.E.} = \text{Weight} \times \text{Height} = 25 \times 5 = 125 \text{ joules}$$

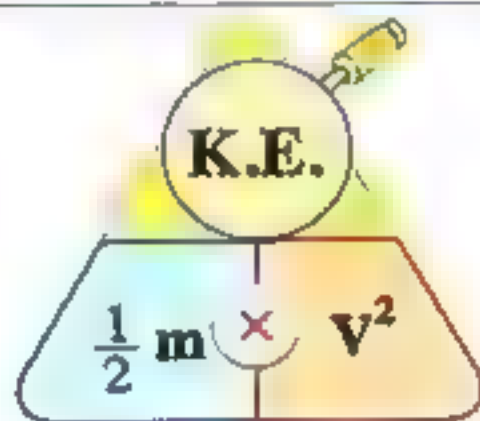
Problem 2 What is the weight of a body, whose potential energy is 88 joules and it is found at a height of 11 m ?

Solution

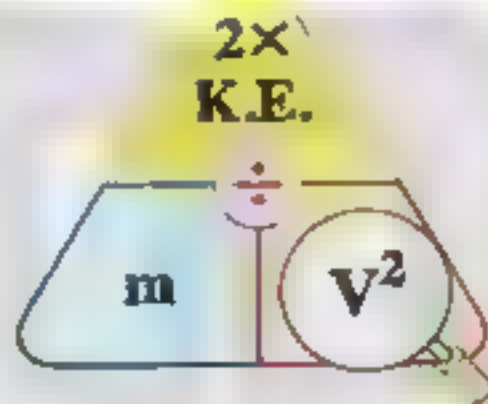
$$\text{Weight} = \frac{\text{Potential energy}}{\text{Height}} = \frac{88}{11} = 8 \text{ newtons}$$

$$\text{Kinetic energy (K.E.)} = \frac{1}{2} \times \text{Mass (m)} \times (\text{Speed})^2 (v)^2$$

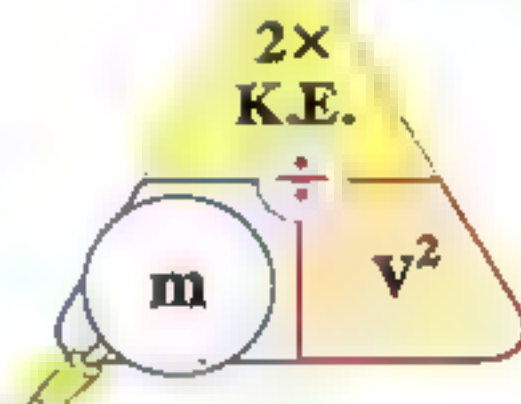
«Joule» «kg» «m/sec.»



To find the kinetic energy



To find the speed



To find the mass

Problem 1 Calculate the kinetic energy of a body, whose mass is 2 kg and moves with a speed of 4 m/sec.

Solution

$$\begin{aligned} \text{K.E.} &= \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2 \\ &= \frac{1}{2} \times 2 \times (4)^2 = 16 \text{ joules} \end{aligned}$$

Problem 2 Calculate the speed of a moving body, whose mass is 80 kg. and its kinetic energy is 4000 joules.

Solution

$$\begin{aligned} \text{K.E.} &= \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2 \\ 4000 &= \frac{1}{2} \times 80 \times (V)^2 \\ 4000 &= 40 \times (V)^2 \\ (V)^2 &= \frac{4000}{40} = 100 \text{ m/sec.} \end{aligned}$$

$\therefore V = 10 \text{ m/sec.}$

4 When an object :

- At maximum height : The mechanical energy = Potential energy.
- On reaching at the ground : The mechanical energy = Kinetic energy.
- At the midpoint of its path : Mechanical energy = 2 × Potential energy
or = 2 × Kinetic energy.

• At any point :

The work done = The mechanical energy of an object = Potential energy + Kinetic energy.

2

Problem A ball was launched upwards vertically at a speed of 3 m/s up to a height of 4 m. Calculate the work done on the ball if its weight = 5 newton, and its mass is 0.5 kg respectively.

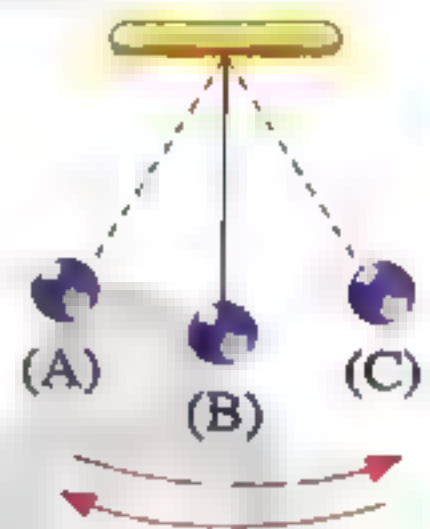
Solution

Potential energy = Weight \times Height = $5 \times 4 = 20$ joules

Kinetic energy = $\frac{1}{2} \times \text{Mass} \times (\text{Speed})^2 = \frac{1}{2} \times 0.5 \times (3)^2 = 2.25$ joules

Work done = Mechanical energy = Potential energy + Kinetic energy
 $= 20 + 2.25 = 22.25$ joules

- 5 • When the ball passes its original position (B), its speed is maximum, so
- Kinetic energy is the maximum value.
 - Potential energy is the minimum value.
- When the ball reaches the maximum height (A & C), its speed is zero, so
- Potential energy is the maximum.
 - Kinetic energy is zero.



Problem 1 Study the given figure which shows a train toy in its path, then answer the following :

i. At what position ... ?

(a) the potential energy is maximum ... ?

(b) the kinetic energy is maximum ... ?

(c) the potential energy is minimum ... ?

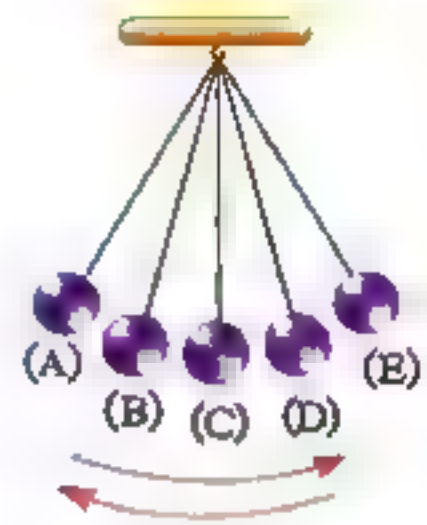
ii. At which of the two positions (E) or (C), the potential energy is larger ? Why ?

Solution

- i. (a) At position (A). (b) At position (B). (c) At position (B).
- ii. At position (E), because the height of (E) from the ground is larger than that of (C) and the potential energy increases by increasing the height.

Problem 2 Study the given figure, then answer :

1. At what position(s), the kinetic energy is maximum ?
2. At what position(s), the potential energy is maximum ?
3. At what position(s), the kinetic energy = the potential energy ?



Solution

1. At position (C).
2. At positions (A) and (E).
3. At positions (B) and (D).

Problem 3 A ball of a pendulum, whose mass is 0.2 kg and its mechanical energy is 1.2 joule, and its kinetic energy during its passing by the original position is 0.9 joule. Calculate :

1. The potential energy of the pendulum at the original position.
2. The kinetic energy of the pendulum at the maximum point.
3. The speed of the pendulum at the moment of passing by the original position.

Solution

1. Potential energy = Mechanical energy – Kinetic energy
 $= 1.2 - 0.9 = 0.3 \text{ joule}$
2. Kinetic energy = zero
3. Kinetic energy = $\frac{1}{2} \times \text{Mass} \times (\text{Speed})^2$
 $(\text{Speed})^2 = \frac{2 \times \text{K.E.}}{\text{Mass}} = \frac{2 \times 0.9}{0.2} = 9 \text{ m/sec.}$
 $\therefore \text{Speed} = 3 \text{ m/sec.}$

4 Important tables:

1 Energy forms and resources :

Energy forms	Energy resources	
• Mechanical energy (Potential energy + Kinetic energy) :	• Stretched spring.	• Waterfalls.
• Light energy :	• Electric lamp.	• Kerosene lamp.
• Sound energy :	• Loudspeakers.	• Radio cassette.
• Electric energy :	• Solar cell.	• Wind generator.
• Chemical energy :	• Car battery.	• Food.
• Heat energy :	• Oil heater. • Heater.	• Oven. • Burning of wood.

2 Energy transformations inside the car :

Car constituents (technological applications)	Energy transformations
• Car engine :	The chemical energy stored in the fuel changes by burning into thermal (heat) energy. – Heat energy changes into mechanical energy (to move the car).
• Car dynamo :	– A part of mechanical energy (kinetic energy) changes into electric energy
• Car lamps :	– A part of electric energy changes into light energy.
• Car radio cassette :	– A part of electric energy changes into sound energy
• Electric heater of car air conditioner :	– A part of electric energy changes into heat energy.

3 Energy transformations in some technological applications :

Technological applications	Energy changes	
	From	To
• Solar cell :	Solar energy	Electric energy
• Solar battery :		
• Nuclear reactor :	Nuclear energy	
• Sewing machine :	Electric energy	Kinetic energy
• Electric fan :		
• Washing machine :		
• Electric heater :	Electric energy	Heat energy
• Electric bell :	Electric energy	Sound energy
• Electric lamp :	Electric energy	Light & heat energies
• A cellular phone :	Electric energy	Light & sound energies
• Television :		
• Solar heater :	Solar energy	Heat energy
• Solar oven :		
• Solar furnace :		

4 Some technological applications and their negative effects :

Technological applications	Negative effects
• Car exhaust :	- It causes chemical pollution for air which causes chest and eye diseases.
• Military explosions :	- They leave harmful effects and diseases and cause death.
• Chemical pesticides :	- They cause chemical pollution for soil, air and water. - They cause cancer and food poisoning.
• Nuclear weapons :	- They cause the massive destruction.
• The webs of wireless transmitters of cellular phones :	- They cause electromagnetic pollution.

5 Some technological applications which produce heat energy :

The device	The resource of energy depending on it	The kind of energy resource	The effect on the environment
• Water heater : • Electric heater :	Electricity	Renewable	Non-polluted
• Solar heater :	The Sun	Permanent	Non-polluted
• Electric stove :	Electricity	Renewable	Non-polluted
• Gas or petrol stove :	Petroleum derivatives	Non-renewable	Polluted
• Gas oven :	Natural gas [Butan gas]	Non-renewable	Polluted
• Coal fire :	Coal	Non-renewable	Polluted

5

Give reasons for

1. The fuel inside the car is similar to the food inside the body of the living organism.
Because burning each of them produces an energy makes the car moves (do work) and the living organism makes its vital processes (do work).
2. Some countries try to use the wind energy and solar energy as resources of energy.
Because they are cheap and clean resources of energy as they do not pollute the environment.
3. The person who pushes a car forward consumes energy.
Because he does a work on the car.

4. **The weight of an object is different from its mass.**
Because object's weight = object's mass \times acceleration due to gravity.
5. **When a stone is thrown upwards, its potential energy increases.**
Because its height increases and the potential energy depends on the height of the object from the ground.
6. **Potential energy will be doubled by doubling the height.**
Because the potential energy is directly proportional to the height of the object,
where : Potential energy = Weight \times Height.
7. **No changes in the potential energy when the object moves horizontally.**
Because its height doesn't change.
8. **When an object falls from up to down, its potential energy decreases gradually.**
Because its height decreases and the potential energy is directly proportional to the height of the object from the ground.
9. **The potential energy of a falling object at the moment of its reaching the Earth's surface equals zero.**
Because the height of the object from the Earth's surface at this moment equals zero and the potential energy of an object = weight \times height.
10. **When the moving object stops, its kinetic energy becomes zero.**
Because the speed of the object becomes zero and the kinetic energy of an object equals $(\frac{1}{2} \times \text{mass} \times (\text{speed})^2)$.
11. **When an object is thrown upwards, its kinetic energy decreases.**
Because its speed decreases and the kinetic energy depends on the speed of the object.
12. **The work done to stop a moving car increases by increasing the speed of the car.**
Due to increasing of its kinetic energy.
13. **The kinetic energy will increase four times as the speed of the moving object is doubled.**
Because the kinetic energy of a moving body is directly proportional to the square of its speed.
14. **The kinetic energy of an object increases when it falls, although its mass is constant.**
Due to increasing of its speed.
15. **The kinetic energy of a moving object increases by the increase of its mass.**
Because the kinetic energy of a moving object is directly proportional to its mass.
16. **The moving object keeps its mechanical energy during motion constant.**
Because the decrease in the kinetic energy of the moving object equals the increase in its potential energy and vice versa.
17. **In the simple pendulum, the kinetic energy of the vibrating body is maximum when it passes its original position during its movement.**
Because at that position, the speed of the ball of the pendulum is maximum and
 $K.E. = \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2$.

18. When the ball of the pendulum reaches the maximum height, the kinetic energy equals zero.

Because at the maximum height, the speed of the ball of the pendulum equals zero.

19. When the ball of the pendulum reaches the maximum height, the potential energy equals the mechanical energy.

Because at the maximum point, the kinetic energy equals zero.

20. The motion of the children's swing is like that of the pendulum.

Because in both of them, the potential energy and kinetic energy are interchanged without ending and the sum of such energies (mechanical energy) at any moment is constant.

21. When two different metals connected with a compass are dipped in a lemon, the needle of the compass deflects.

Due to flowing of an electric current.

22. An electric current is generated when copper wire and zinc plate are dipped inside a lemon after connecting them with an electric lamp.

Because the chemical energy stored in the lemon is converted into electric energy.

23. You should take care of touching the electric lamp in your house on lightening.

Because it is very hot as electric energy is changed into heat and light energies.

24. Using of batteries in the electric circuits.

To generate an electric current in the circuit.

25. Car engine is important to the car.

Because in which, the chemical energy stored in the fuel is changed by burning into heat energy which changes into mechanical energy causing the operation of the car.

26. Some technological applications have negative effects.

Because some of technological applications cause environmental pollution as :

- electromagnetic pollution.
- noise pollution.
- chemical pollution for air, water and soil.

In addition to when man used them in : • wars and killing. • massive destruction.

27. Car exhaust is considered from the negative effects of technological applications.

Because it causes chemical pollution for air.

28. You must rationalize using chemical pesticides.

Because they cause chemical pollution for water, air and soil, and cause cancer and food poisoning.

29. Ecologists do not appreciate all the technological applications which are used in energy transformations.

Because some of these applications have negative effects on the environment.

30. You feel warm when you rub your hands together in winter.

Because the kinetic energy is converted into heat energy by friction.

31. When you shake metallic spheres in a closed tube, their temperature increases.

Because by friction, mechanical energy is changed into heat energy.

32. The temperature of objects increases by increasing its speed.

Due to the increasing of the kinetic energy.

33. You feel hot when you touch a hot metallic spoon.

Because heat is transferred from the hot object to the cold object by conduction.

34. The nail gets hot when you pull it out from a thick wooden piece.

Because the friction between the nail and the wooden piece generates heat energy which causes the hotness of the nail.

35. Cooking pans are made up of aluminium.

Because aluminium is a good conductor of heat.

36. • The freezer is found at the top of the fridge.

• Air conditioner is put at high position in the room.

Because when air is cooled, its density increases, so it falls down to cool the food (or the room) and the hot air rises up to be cooled again and so on.

37. Heater is put at the bottom of the room.

Because when air (around the heater) is heated its density decreases so it rises up to warm the room, while the cold air falls down to be heated again and so on.

38. The heat of the Sun doesn't reach to the Earth by conduction or convection.

It isn't transferred by conduction, because air is a bad conductor of heat and it is not transferred by convection, because there is a space (vacuum) between the Sun and the Earth.

39. The heat of the Sun is transferred to us by radiation.

Because the transfer of heat by radiation doesn't need any material medium through which heat transfers.

40. It is preferred to use Sun and electricity as sources of heat energy than coal and petrol.

Because Sun and electricity don't pollute the environment, while coal and petrol pollute the environment.

41. Importance of solar energy in our life.

Because it is the main source of most energies on the Earth's surface.

42. Nuclear stations which produce electricity are preferred to those of petrol stations.

Because nuclear stations don't pollute the environment, while petrol stations pollute the environment.

43. The production of electricity from solar energy is preferred to that produced from burning of fuel.

Because solar energy is a clean source of energy which doesn't pollute the environment and it is a permanent source of energy, while fuel pollutes the environment and it is a non-renewable source of energy.

44. Solar energy is among preferable kinds of energy.

Because solar energy is a clean source of energy which doesn't pollute the environment and it is a permanent source of energy.

45. A solar heater is preferred than a gas heater or electric heater.

Because solar heater doesn't pollute the environment and it depends on the Sun which is a permanent and cheap resource of energy.

6

What happens when ...?

- An object is thrown upwards.**
Its potential energy increases.
- Decreasing the potential energy of a moving body by 200 joules.**
The kinetic energy increases by 200 joules.
- Doubling the weight of an object (concerning its potential energy).**
Its potential energy is doubled.
- Doubling the speed of a moving object (concerning its kinetic energy).**
Its kinetic energy increases four times.
- Falling an object from a high position (concerning its mass).**
Its mass doesn't change.
- Increasing the height of an object from the Earth's surface to double and decreasing its mass to half (concerning its potential energy).**
Its potential energy doesn't change.
- Doubling the mass of a moving object (concerning its kinetic energy).**
Its kinetic energy is doubled.
- Increasing the speed of an object to double and its mass decreases to half (concerning its kinetic energy).**
Its kinetic energy is doubled.
- Push the ball of a simple pendulum with your hand (concerning the speed)**
When the ball passes its original position, its speed is maximum, while when it reaches the maximum height, its speed is zero.
- The ball of the pendulum passes its original position (concerning kinetic and potential energies).**
Its kinetic energy is maximum, while its potential energy is minimum.
- The ball of the moving pendulum strikes the ball of the rest one.**
The ball of the rest pendulum moves, while the ball of the moving pendulum stops.
- The ball of the pendulum reaches the maximum height (concerning kinetic and potential energies).**
Its kinetic energy equals zero, while its potential energy is maximum.
- Dipping two different metals connected by a wire in an acidic solution.**
An electric current flows through the wire.
- Coil the wire of a simple cell around a compass.**
The needle of the compass deflects.

PART

2

15. Close an electric circuit containing an electric lamp.

The electric lamp illuminates.

16. Close the key of an electric circuit connected with an electric bell.

The electric bell rings.

17. Man used military explosions.

Harmful effects and diseases are produced and cause death.

18. Overuse of chemical pesticides.

They cause chemical pollution for water, air and soil and hence cause cancer.

19. Construction of the webs of wireless transmitters of cellular phones near the buildings.

They cause the electromagnetic pollution.

20. Rubbing your hands together.

The mechanical energy changes into heat energy by friction.

21. • The kinetic energy of some spheres increases.

• Increasing the speed of a group of objects and their friction with each other.

Their temperature increases.

22. Two objects touch each other, one of them is hot and the other is cold.

Heat energy transfers from the hot object to the cold object until their temperatures become equal.

23. Two objects have the same temperature touch each other.

The temperature doesn't transfer between them.

24. You touch the outer end of a metallic spoon placed inside a glass of hot water.

The heat transfers from the spoon to the hand by conduction.

25. You fix the freezer in the lower part of refrigerator.

The lower part of refrigerator only is cooled, because the cold air (of high density) doesn't rise up.

26. You use a petrol stove (related to the environment).

It pollutes the environment.

7

Comparisons

1 Potential energy and kinetic energy :

Points of comparison	Potential energy	Kinetic energy
• Definition :	It is the energy stored in the object due to the work done on it.	It is the work done during the motion of an object.
• Factors affecting it :	<ul style="list-style-type: none"> • Weight of the body. • Height from the ground. 	<ul style="list-style-type: none"> • Mass of the body • Speed of the body.
• Law used :	Potential energy = Weight \times Height.	Kinetic energy = $\frac{1}{2} \times \text{Mass} \times (\text{Speed})^2$

2 Ways of heat transfer :

Points of comparison	Heat transfers by conduction	Heat transfers by convection	Heat transfers by radiation
• Definition :	It is the transfer of heat through some solid objects from the part of higher temperature to the part of lower temperature.	It is the transfer of heat in gases and liquids, where hot molecules which have less density rise upwards, while colder molecules which have more density, fall down.	It is the transfer of heat from hot object to another without any need for a material medium through which heat transfers.
• The medium transfers through :	Some solid objects.	Liquids and gases.	No medium.
• Application :	Cooking pans are made up of copper and aluminium.	The freezer of the fridge is found at the top of the fridge.	Heat of the Sun transfers through us by radiation.

8

Activities



ACTIVITY

To show the effect of object's weight on its potential energy :



Steps :

1. Lift a ball from the ground up to a table level.
2. Repeat using two and three balls, then four balls.



Observation :

The work done to lift balls increases by increasing the weight of the balls.



Conclusion :

The potential energy stored in an object increases by increasing its weight.

(i.e : The potential energy of an object is directly proportional to its weight.)

PART

2

**ACTIVITY 2**

To show the effect of the height of an object from the ground on its potential energy :

**Steps :**

1. Bring a basin filled with sand and a metallic sphere.
2. Raise the sphere a half metre high and let it fall in the basin.
3. Repeat the previous step several times by increasing the height of the ball and returning the sand graded every time.

**Observation :**

The metallic sphere makes a print on the sand and it becomes deeper by increasing the height.

**Conclusion :**

The potential energy increases by increasing the height at which the object reaches.
(i.e : The potential energy of an object is directly proportional to its height from the ground.)

**ACTIVITY 3**

To prove the conservation of mechanical energy of a body :

**Step :**

Push with your hand gently a simple pendulum, then leave it.

**Observations :**

1. The ball of the pendulum moves on both sides around its original position (B).
2. The speed of the vibrating ball decreases as it goes away from its original (initial) position.
3. The speed of the vibrating ball is maximum when it passes its original position during its movement.

**Conclusion :**

The object keeps its mechanical energy which alternates between potential energy and kinetic energy.

ACTIVITY 4 To make a model of a simple cell :

Tools :

- A large lemon.
- A small compass.
- A copper wire.
- A zinc rod.

Steps :

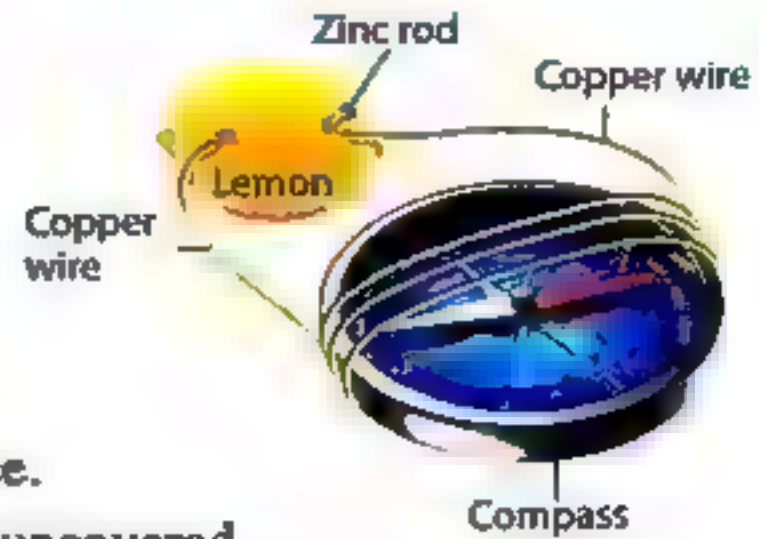
1. Press the lemon to soften it and to increase its juice.
2. Make the two terminals (ends) of the copper wire uncovered.
3. Coil one of the uncovered terminal of the copper wire around the zinc rod, then dip the zinc rod into the lemon.
4. Coil the wire around the compass, then dip the uncovered terminal into the lemon.

Observation :

The needle of the compass deflects.

Conclusion :

1. The simple cell consists of two different metals dipped in an acidic solution.
2. In the simple cell, the chemical energy is changed into electric energy.



ACTIVITY 5 To show the changes of energy in the electric lamp :

Tools :

- A battery of 3 volts.
- An electric lamp.
- Connecting wires.
- A switch.

Steps :

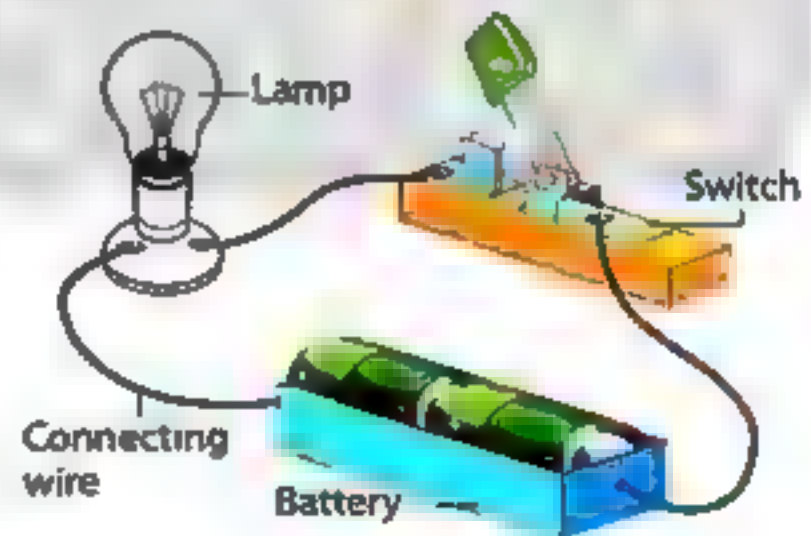
1. Connect the electric circuit (as shown in the figure).
2. Close the circuit for one minute, then open it again.
3. Touch the glass of the lamp with your hand.

Observation :

The lamp lights and becomes hot.

Conclusion :

In the electric lamp, the electric energy is changed into light energy and heat energy.





ACTIVITY 6

To prove the kinetic energy changes into heat energy :



Steps :

1. Put a group of metallic spheres in a plastic jar and record their temperature first by using a thermometer.
2. Close the jar tightly, then shake it rapidly from 20 to 30 times then determine the temperature at the end.



Observation :

Increasing the temperature of the spheres.



Conclusion :

- Kinetic energy changes into heat energy, because spheres' movement and their friction with each other causes temperature rise.
- The temp. is directly proportional to the speed of objects and its kinetic energy.



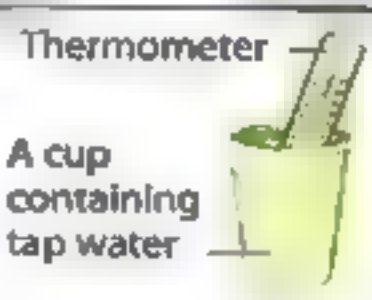
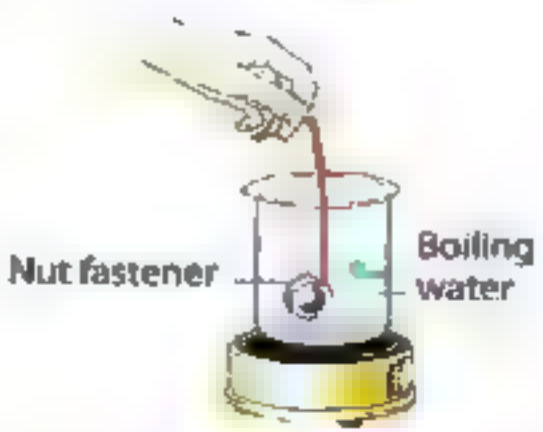
ACTIVITY 7

Heat and its transferring :



Tools :

- A plastic cup containing tap water.
- A thermometer.
- A metal piece (as a nut fastener) tied by a thread.
- A beaker containing boiling water.

Steps	Figures	Expected temperature
1. Record the temperature of the cold tap water by using the thermometer.		The recorded temperature is 20°C
2. Submerge the nut fastener in the boiling water by a thread for several minutes until both of them become equal in temperature then record this temperature.		The recorded temperature is 100°C

3. Transfer the nut fastener from the boiling water to the cold tap water, then record their temperature together.



The recorded temperature is 25°C

Observation :

The temperature of water on putting the hot nut fastener in it is more than the temperature of tap water and less than the temperature of boiling water.

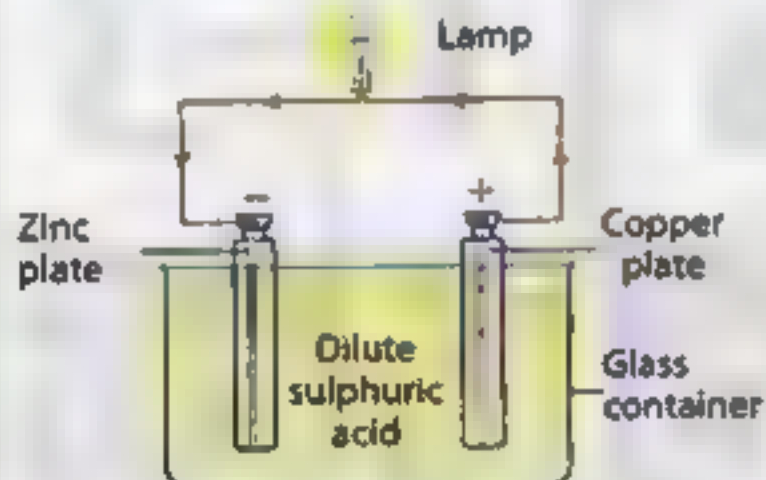
Conclusion :

Heat is transferred from an object of higher temperature to another of lower temperature, then it stops when they are equal in temperature.

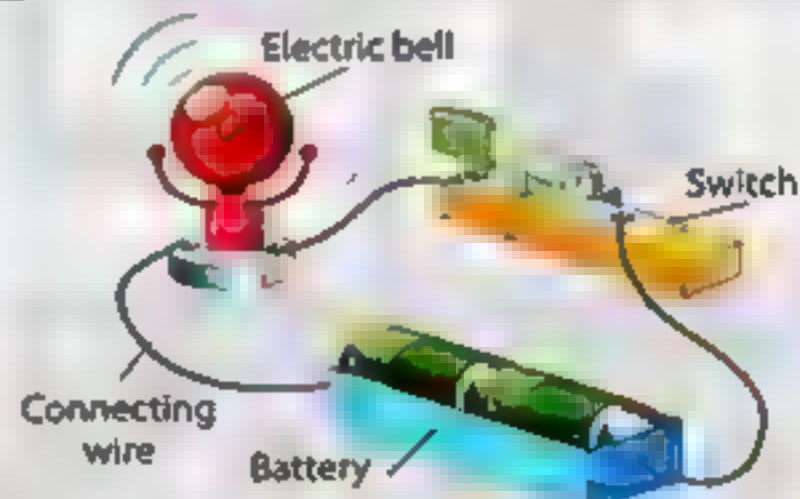
9

Important drawings

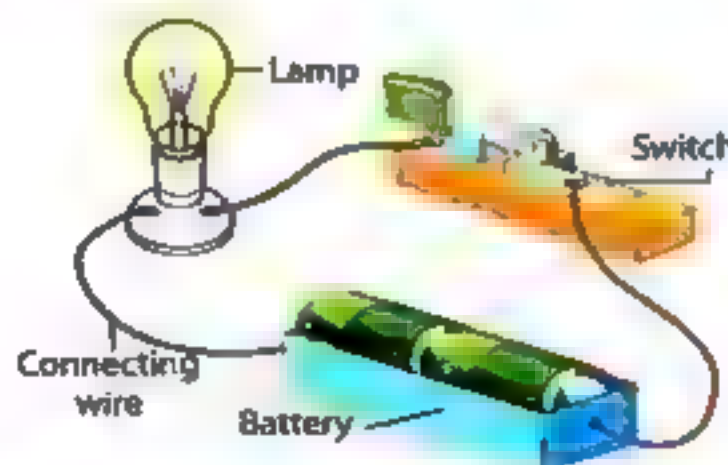
1. Simple electric cell.



2. Electric circuit to attend a blind person.



3. Electric circuit to attend a deaf person.



Final Revision on Unit

3

Definitions (on scientific terms)

1. Taxonomy :	It is a branch of biology that searches for the similarities and the differences among living organisms and it places the similar ones in groups according to a certain system in order to ease their study.
2. Micro-organisms :	They are living organisms that can't be seen by the naked eye, but they spread everywhere around us, (in air, water and soil).
3. Algae :	They are the plants that can't be distinguished into roots, stems and leaves.
4. Ferns :	They are small terrestrial plants that reproduce by formation of spores.
5. Gymnosperms :	They are the plants which their seeds are formed inside cones and not inside a pericarp (fruit envelope).
6. Angiosperms :	They are flowering plants which their seeds are formed inside a pericarp.
7. Arthropods :	They are invertebrate animals that are characterized by the presence of jointed legs.
8. Species :	<ul style="list-style-type: none"> - It is a group of more similar living organisms in shape that can reproduce to give birth of new fertile individuals which are able to reproduce and keeping the existence of the species. - It is the basic classification unit for living organisms.
9. Adaptation :	It is a modification of a living organism's behaviour, body structure, or organs biological functions to become more adapted to the environmental conditions where it lives in.
10. Structural (anatomical) adaptation :	It is a modification in the structure of one of body external organs of a living organism to cope with the environmental conditions.
11. Functional adaptation :	It is a modification in some organs and tissues of the body of a living organism to become able to do specific functions.
12. Behavioural adaptation :	It is a modification in the behaviour of a living organism at specific times of the day or the year.
13. Predacious (insectivorous) plants :	They are autotrophic green plants that their roots can't absorb the nitrogenous substances needed to make proteins.
14. Hibernation :	It is the behaviour through which some animals try to dormancy and stop most of their vital activities to avoid the low temperature in winter.
15. Aestivation :	It is the behaviour through which some animals try to dormancy and stop most of their vital activities to avoid the extreme rise in temperature in summer and shortage of water and rains.

16. Birds migration :	It is the inherited behaviour in some species of birds, where they migrate from cold and polar regions to more lighted and warmer regions for reproduction.
17. Camouflage :	It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

2

Important tables

1 Diversity and classification of living organisms :

Living organisms	Examples
1. Big animals :	Elephant – Rhinoceros – Camel.
2. Small animals :	Rabbit – Rat – Lizard.
3. Animals live in water :	Fishes – Crocodiles – Hippopotami.
4. Animals live on land :	Horse – Lion – Dog.
5. Huge trees :	Camphor – Palm.
6. Short weeds :	Clover – Gargeer.
7. Plants carry large-sized leaves :	Banana.
8. Plants carry small-sized leaves :	Molukhiyah.
9. Micro-organisms (unicellular organisms) :	Amoeba – Euglena – Paramecium.
10. Plants can't be distinguished into roots, stems and leaves :	Algae (green, red and brown algae).
11. Plants are distinguished into roots, stems and leaves :	Maize (corn) – Wheat – Palms – Camphor.
12. Plants reproduce by formation of spores :	Vougheir – Adiantum.
13. Plants reproduce by formation of seeds :	• Gymnosperms : Pine – Cycas. • Angiosperms : – Monocotyledon plants : Maize – Wheat. – Dicotyledon plants : Bean – Pea.
14. Animals with soft bodies :	Jellyfish – Octopus – Earthworm.

15. Animals with supported bodies :	<ul style="list-style-type: none"> • External support : Mussel – Desert snail. • Internal support : Vertebrates (birds – cow and fish).
16. Insects :	Locusts – Bees – Flies – Cockroaches.
17. Arachnids :	Spider – Scorpion.
18. Myriapods :	Scolopendra – Julius.
19. Edentates (Teethless mammals) :	Sloth – Armadillo.
20. Mammals having teeth :	<ul style="list-style-type: none"> • Animals have front teeth extending outwards : Hedgehog. • Animals have pointed canines and molars with sharp projections : Lion – Tiger. • Animals have sharp incisors : – Rodents : Rat – Jerboa – Squirrel. – Lagomorphs : Rabbit.

2 Examples for some living organisms :

Living organisms	Examples
1. Insectivorous plants :	Dieonea – Drosera – Halophila.
2. Extinct animals :	Mammoth – Dinosaurs.
3. Animals make hibernation :	Some reptiles – Some insects – Frogs – Toads.
4. Animals make aestivation :	Jerboa – Desert snail – Some insects.
5. Animals make migration :	Quail bird.
6. Animals adapted by camouflage :	Leaf insect – Stick insect – Chameleon.

Function (or importance)

1. The thick flat pad at the end of camel's limbs :	To enable the camel wandering through the hot desert sand.
2. Strong solid hoof at the end of horse's limbs :	To enable the horse to run on the rocky soil.
3. Paddles in dolphins :	To perform the function of swimming and diving in water.
4. Wings in bats :	To help them to fly.
5. Elongated fingers in monkey :	To enable it to climb trees and catch things.
6. Strong and sharp crooked beaks in hawks :	To tear the preys' flesh.

7. Front fingers and the bendable posterior one in vultures :	To control pouncing the prey.
8. Long thin beaks in heron :	To pick up worms and snails.
9. Long thin legs in hoopoe :	To suit walking in water.
10. Wide indented beaks in ducks :	To filter their food from water.
11. Palm legs in geese :	To help them in swimming.

4

Give reasons for

1. Living organisms must be classified.

Due to the enormous diversity in living organisms species, so they must be classified into groups to facilitate their studying.

2. We can distinguish between banana plant and molukhiyah plant.

Because banana plant carries large-sized leaves, while molukhiyah plant carries small-sized leaves.

3. Amoeba is from micro-organisms.

Because it is from unicellular organisms that can be seen only by the microscope.

4. Adiantum plant is classified as a fern plant.

Because it is considered as small terrestrial plant which reproduces by formation of spores.

5. Cycas is a gymnosperm plant.

Because its seeds are formed inside cones and not inside a pericarp (fruit envelope).

6. Pea and wheat plants are angiosperm plants.

Because their seeds are formed inside a pericarp.

7. The body of jellyfish and octopus is soft.

Because their bodies don't have support.

8. Cockroach and locust are classified as insects.

Because they are arthropods that have three pairs of jointed legs.

9. Spider and scorpion belong to arachnids.

Because they are arthropods that have four pairs of jointed legs.

10. Scorpion (or spider) isn't considered from insects.

Because scorpion (or spider) is characterized by the presence of four pairs of jointed legs, while insects are characterized by the presence of three pairs of jointed legs.

11. Scolopendra and julius are classified as myriapods.

Because they have numerous legs.

12. Sloth and armadillo are classified as edentate animals.

Because they have no teeth.

13. The front teeth of hedgehog are extending outwards.

To capture insects.

14. Rat (or squirrel) is from rodents, while rabbit is from lagomorphs.

Because rat (or squirrel) has one pair of incisors in each jaw, but rabbit has two pairs of incisors in the upper jaw and one pair in the lower jaw.

15. The individuals of the same species differ in some external characteristics.

Because each of them has its specific shape.

16. When a zebra mates a donkey, they can't produce fertile individuals.

Because zebra and donkey are from two different species.

17. The diversity and adaptation of living organisms.

To cope with the environmental changes.

18. Camel's limbs end in a thick flat pad.

To enable the camel wandering through the hot desert sand.

19. Horse's limbs end in a strong solid hoof.

To help the horse go through the rocky soil.

20. Secreting poison in snakes is considered a functional adaptation, while the shape of horse's limb is considered a structural (anatomical) adaptation.

Because functional adaptation represents a modification in a specific organ to be able to do a specific function (secreting poison), while anatomical adaptation represents a modification in the structure of one of body external organ to cope with the environmental conditions (horse's limb).

21. Secreting sweat in humans in case of high temperature is considered a functional adaptation.

Because it represents a modification in a special organ to be able to do a specific function (secreting sweat).

22. Birds migration is a behavioural adaptation.

Because it represents a modification in the behaviour of birds at a certain time in order to survive.

23. Occurrence of adaptation in animal world.

To get food, move in different environments and escape from their enemies in dangerous situations.

24. • Mammals' limbs are adapted in many forms.

• Although limbs of mammals are composed of the same bones, some modifications took place in them.

To match with the way of movement, mode of living and the dominant environmental conditions.

25. The front limbs of whales and sea lion are modified into paddles.

To perform the function of swimming and diving in water.

26. Bat's front limbs are modified into wings.

To perform the function of flying.

27. In monkeys, bones of the front limbs and fingers are elongated.

To perform the function of climbing trees and catching things.

28. The two front limbs in the dolphin are different from bat's ones although they are structured with similar bones.

Due to the modification of front limbs to suit the way of movement, where in dolphin they are modified into paddles to perform the function of swimming and diving, while in bat they are modified into wings to perform the function of flying.

29. Beaks and legs of birds are modified in many different ways.

To suit the way of movement, the type of food that the bird feeds on and the environmental conditions.

30. Predatory birds have strong and sharp crooked beaks.

To tear their prey's flesh.

31. • The fingers of predatory birds end in strong sharp claws.

• The legs of predatory birds have three anterior fingers and posterior one.

To control pouncing the prey.

32. Some birds have long thin beaks and long thin legs ending in thin toes.

The beaks are long and thin to pick up worms and snails and their legs are long thin ending in thin toes to walk in the existence of water.

33. Ducks and geese have wide indented beaks and palm legs.

The beaks are wide indented to help them to filter the food from water and the palm legs to help them in swimming.

PART

2

34. Insectivorous plants are autotrophic plants.

Because they can make their own food (carbohydrates) by photosynthesis process.

35. Some parts of leaves of insectivorous plants are modified.

To pounce and digest the insects, then absorb the nitrogenous substances that the plants' bodies need.

36. Some plants pounce and digest insects.

To absorb the nitrogenous substances that their bodies need.

37. • Some animals hibernate in winter.

- Some reptiles hide in burrows, while frogs bury themselves in mud and stop feeding in winter.

To overcome the decrease in temperature.

38. • Some animals undergo aestivation.

- Jerboa becomes dormant and hides in humid burrows in summer.

To overcome extreme rise in temperature and shortage of water and rains.

39. Some birds migrate from their original habitats in winter.

To search for more lighted and warmer regions for reproduction.

40. Quail bird is a good example of adaptation to the environmental conditions.

Because in winter, quail bird migrates from cold and polar regions to more lighted and warmer regions for reproduction at the same time every year.

41. Leaf insect is hardly to be discovered by its enemies.

Because it looks like the plant leaf exactly in its colour and shape of wings.

42. It is hard to discover the stick insect.

Because it looks like the branches of plants as well.

43. Chameleon colours itself with the dominant colour in the environment.

To be hidden from its preys of insects to capture them and feed on them.

44. The camel is considered a desert ship.

Because it is considered one of the most adapted animals to live in desert environment.

5

What happens when?**1. Removing the front teeth of hedgehog.**

It is unable to capture insects.

2. Mating between two individuals from the same species from living organisms.

It produces new fertile individuals from the same species.

3. **Mating between a zebra and a donkey.**
It produces a sterile female called "Zonkey".
4. **Mating between a donkey and a horse.**
The product offspring will be a sterile female called "Mule".
5. **Camel exchanges its pad with a horse's hoof.**
The feet of the camel sink into the sand and the horse cannot run on the rocky soil.
6. **The front limbs of whales are not modified into paddles.**
They become unable to swim and dive in water.
7. **The bones of front limbs and fingers of monkeys are not elongated.**
They become unable to climb trees and catch objects.
8. **The front limbs of bats are not modified into wings.**
They become unable to fly.
9. **The beaks of predatory birds are weak.**
They become unable to tear the flesh of preys.
10. • **The fingers of predatory birds are not ended in claws.**
• **The four fingers of predatory birds lie at the same side.**
They become unable to control their pouncing preys.
11. **The beaks of ducks are narrow and not indented.**
They become unable to filter their food from water.
12. **The legs of geese are not palm.**
They become unable to swim.
13. **The beak of heron is not long and thin.**
It can't pick up worms and snails.
14. **The beaks of hoopoe and hawk are mutually exchanged.**
Hoopoe feeds on meat and hawk feeds on worms and snails.
15. **Predatory plants cannot capture insects for a long period.**
They cannot make their needed proteins.
16. • **A desert animal does not make aestivation in summer.**
• **No aestivation occurs to jerboa.**
It will die, because it can't tolerate the extreme rise in temperature and shortage of water and rain.
17. **The aestivated animals don't store their food in the form of fats.**
They will die, because they don't obtain the enough food during aestivation.

PART

2

18. The polar bear could not hibernate.

It will die because it can't tolerate the extreme cold.

19. Quail birds do not migrate from cold places in winter to warmer ones.

They are unable to make reproduction process and may die.

20. Chameleon can't make camouflage process.

Chameleon can't capture its preys for feeding, and it may be seen by its enemies which prey it.

21. Stick insect or leaf insect settle on a white wall.

It is easily to be discovered by its enemies.

6

What are the results based on?

1. Increasing the well known species of living organisms.

Putting plans of classification of living organisms.

2. The variety of ways of movement in mammals.

Some adaptations took place in mammal's limbs to suit the way of movement.

3. The variety of food for birds.

Their beaks are modified into several shapes.

4. Living mammals in varied environments.

Their front limbs are modified to suit the ways of movement.

5. Stick insect looks like the branches of plants.

It can hide from its enemies.

7

Comparisons

1 Gymnosperms and angiosperms :

Points of comparison	Gymnosperms	Angiosperms
• Seeds :	Their seeds are formed inside cones.	Their seeds are formed inside fruit envelope (a pericarp).
• Examples :	Pine and cycas.	Maize and bean.

2 Insects , arachnids and myriapods :

Points of comparison	Insects	Arachnids	Myriapods
• No. of jointed legs :	3 pairs.	4 pairs.	Large number.
• Examples :	Locusts and bees.	Spiders and scorpions.	Julius and scolopendra.

Final Revision

3 Rodents and lagomorphs :

Points of comparison	Rodents	Lagomorphs
• No. of incisors in each jaw :	One pair in each jaw.	Two pairs in the upper jaw and one pair in the lower jaw.
• Examples :	Rat and squirrel.	Rabbit.

4 Camel's limbs and horse's limbs :

Camel's limbs	Horse's limbs
Camel pad ends in a thick flat one to enable the camel wandering through the hot desert sand.	Horse hoof ends in a strong solid end to help the horse go through the rocky soil.

5 Types of adaptation :

Points of comparison	Structural (anatomical) adaptation	Functional adaptation	Behavioural adaptation
• Definition :	It is a modification in the structure of one of body external organs of a living organism to cope with the environmental conditions.	It is a modification in some organs and tissues of the body of a living organism to become able to do specific functions.	It is a modification in the behaviour of a living organism at specific times of the day or the year.
• Examples :	- Structure of camel's pad. - Structure of horse's hoof.	- Secreting sweat on rising temperature as in human body. - Secreting poison as in some snakes.	- Birds migration. - Activity of birds during daylight and bats at night.

6 Leaf insect , stick insect and chameleon :

Points of comparison	Leaf insect	Stick insect	Chameleon
• Features of adaptation :	It looks like the leaf of the plant.	It looks like the branches of plants.	It colours itself with the dominant colour of the environment.
• The reason of adaptation :	To be hardly discovered by its enemies.	To be hardly discovered by its enemies.	To be hidden from its preys of insects.

PART

2

7 Birds that feed on meat, birds that feed on worms and snails, and birds that feed on mosses and fishes :

Points of comparison	Birds that feed on meat (predatory birds)	Birds that feed on worms and snails	Birds that feed on mosses and fishes (water birds)
• Beaks :	They are strong and sharp crooked to tear the prey's flesh.	They are long thin to pick up worms and snails.	They are wide indented in the two sides to help them filter the food from water.
• Legs :	They have four fingers ending in strong and sharp claws, three anterior (front) fingers and one posterior (back) bendable to control pouncing the prey.	They are long thin ending in thin fingers to walk in the existence of water.	They end with palm fingers to help them in swimming.
• Examples :	Hawks and vultures.	Heron and hoopoe.	Ducks and geese.

8 Hibernation and aestivation :

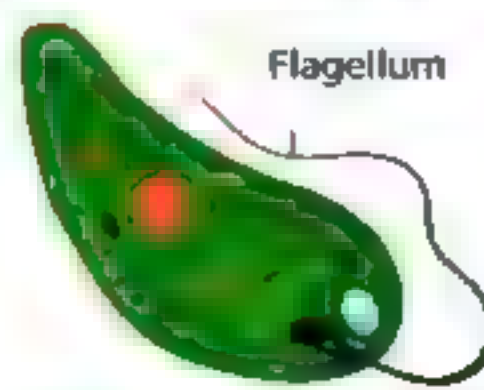
Points of comparison	Hibernation	Aestivation
• Time :	In winter.	In summer.
• Features of adaptation :	<ul style="list-style-type: none"> - Some animals hide in burrows as some reptiles and some insects. - Some animals bury themselves in mud, stop feeding and their activities decrease as frogs and toads. 	Animals become dormant and hide in humid burrows as jerboa, desert snail and some insects.
• The reason of adaptation :	To overcome the decrease in temperature.	To overcome the extreme rise in temperature and the shortage of water and rains.

8

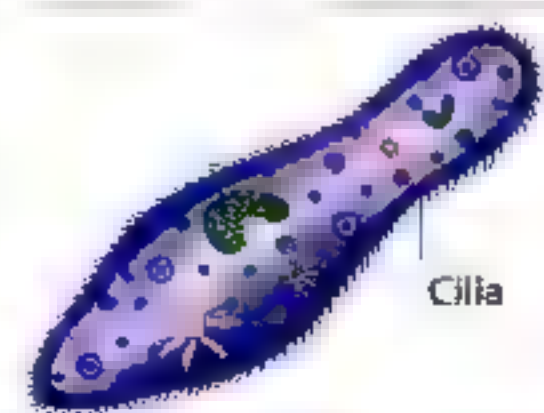
Important drawings :



Amoeba



Euglena



Paramecium

UNIT ONE

Lesson

1

Matter and its Characteristics

Worksheet

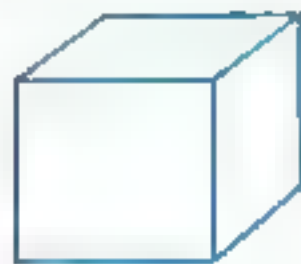
1

1. Complete the following :

1. We can distinguish between ammonia and perfume by their different
2. and can float on water surface, while and can sink in water.
3. Density is of unit volume of the substance and its measuring unit is
4. is the measuring unit of mass, while is the measuring unit of volume.
5. , and are from the physical properties of matter.

2. Choose the correct answer :

1. The volume of the liquid is calculated from the relation
 a. $\frac{\text{mass}}{\text{density}}$ b. $\frac{\text{density}}{\text{mass}}$ c. $\text{mass} \times \text{density}$ d. no correct answer.
2. If you know that the density of water is 1 gm/cm^3 , so the volume of 10 gm of water is
 a. 5 cm^3 b. 10 cm^3 c. 20 cm^3 d. 40 cm^3
3. The taste property is the distinguishing factor between
 a. milk and honey. b. wood and plastic.
 c. silver and gold. d. oxygen and nitrogen.
4. The density of helium is that of air.
 a. less than b. more than c. equal to d. no correct answer
5. If the following shapes have the same mass. Which of them has the smallest density ?
 Fig.



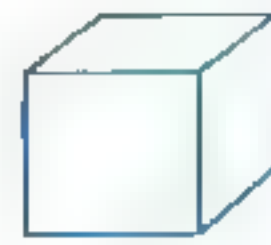
a



b



c.



d

3. Give reasons for :

1. Equal volumes of different substances have different masses.

.....

Worksheets

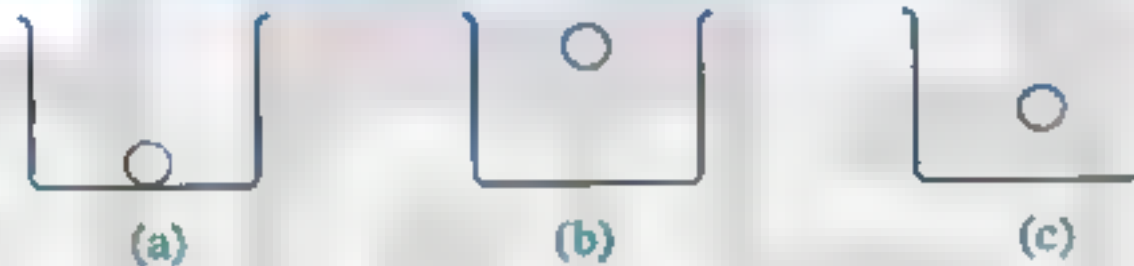
2. An iron nail sinks in water, while one kilogram of cork floats on water surface.

3. Water isn't used to put out petrol fires.

4. A. Complete the following table :

Substance	Mass (gm)	Volume (cm ³)	Density (gm/cm ³)
(A)	22	.....	2
(B)	5	20	.....
(C)	.....	15	1

B. The following figures represent three balls of the same volume and mass. They are put in three beakers containing different liquids :



1. Arrange the liquids in a descending order according to their densities.

2. Which liquid has the same density of the ball ?

5. Problems :

1. When a piece of iron of mass 78 gm is put in a graduated cylinder containing 100 cm³ of water, the reading of the cylinder becomes 110 cm³.

Calculate the density of the piece of iron.

2. When five similar copper pieces are put in a graduated jar containing 60 cm³ of water, the level of water reaches 75 cm³. If the density of copper is 8.8 gm/cm³. Find the mass of each piece.

PART

1

3. In an experiment to determine the density of a liquid, the following results are recorded :

- The mass of an empty cylinder = 56 gm.
- The mass of the beaker containing liquid = 156 gm.
- The volume of the liquid = 100 cm^3 .

Calculate the density of the liquid.

.....

.....

4. If the mass of an empty graduated cylinder is 20 gm, its mass when it is filled completely with water is 30 gm and its mass when it is filled completely with unknown liquid is 27 gm. Calculate the density of this unknown liquid. (Density of water is 1 gm/cm^3).

.....

.....

Worksheet 2

1. What is meant by ... ?

1. Melting point :
2. Boiling point :

2. Complete the following :

1. and ... are from the substances which have low melting points, while and ... are from the substances which have high melting points.
2. Separation of petroleum components depends on the difference in their
3. is one of the solid substances which appears soft at room temperature, while ... is a solid substance which doesn't soft by heating.
4. An alloy of ... is used in making jewels, while an alloy of ... is used in making heating coils.

3. Give reasons for :

1. Cooking pans are made up of aluminium or stainless steel.
.....
2. A piece of ice melts when it is left in air.
.....
3. Iron rods are used in building houses' concrete, but copper rods are not used.
.....

4. What is meant by ... ?

- The melting point of ice = 0°C :
- The boiling point of water = 100°C :

Worksheet 3

1. Mention an example for :

- A substance has low melting point. [.....
- A very active metal. [.....
- A substance used to plate iron. [.....
- An inactive metal. [.....

2. Study the following figures, then answer the following :

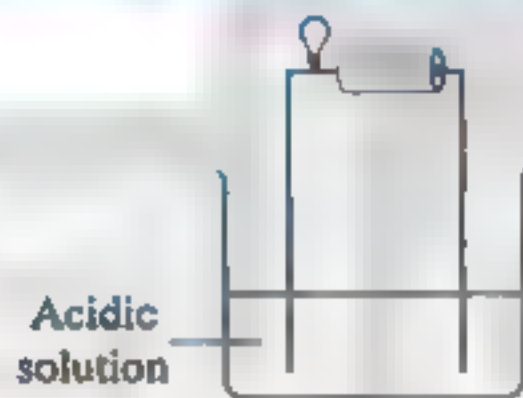


Fig. (1)

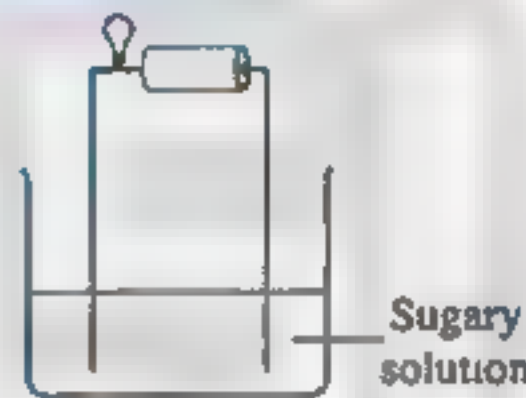


Fig. (2)

In which figure does the lamp illuminate ? Why ?

.....

3. Complete the following sentences :

- and gold are metals , so they are used in making jewels.
- and solutions are good conductors of electricity, while and solutions are bad conductors of electricity.
- Electric wires are made up of .. or as they are conductors of electricity.
- Light posts in streets are painted from time to time in order to protect them from ..

4. Give reasons for :

- An electrician uses a screwdriver made up of a steel iron with a plastic handle.
.....
- Aluminium cooking pans are washed with a rough material.
.....

UNIT ONE

Lesson

2

Matter Construction

Worksheet

4

1. What happens when you ... ? Why ?

1. Open a bottle of perfume in a closed room for a while.

.....

2. Add 100 cm³ of water to 50 cm³ of ethyl alcohol.

.....

3. Try to break an iron piece with your hand.

.....

2. Complete the following :

1. Matter consists of small building units called

2. Gases are characterized by large and very weak, so they have shapes and volumes.

3. take the shape of the container, while have no definite shape.

3. Give reasons for :

1. A drop of ink spreads through water.

.....

2. Solids have definite shapes and volumes.

.....

3. It is easy to divide an amount of water into smaller parts.

.....

4. What is meant by the molecule ? Mention the properties of the molecules of matter.

.....

Worksheet 5

1. A. Give reasons for :

1. Heat changes the matter from the solid state into the liquid state.

2. When water gains energy, it converts into gas.

B. Complete the following :

1. During vaporization process, liquid molecules energy and change into molecules.
2. The attraction force between molecules of is very strong and almost not exist in

2. A. Put (✓) or (x) :

1. The attraction force among molecules of solids are very small. ()
2. The motion of the molecules of gas is limited. ()
3. The intermolecular distances among the molecules of gaseous matter are limited. ()

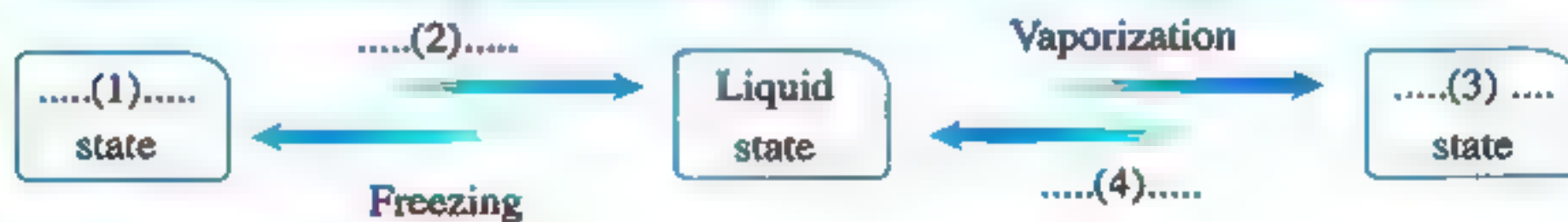
B. What is meant by ... ?

1. Melting process :
2. Vaporization process :

3. Complete the following table :

Points of comparison	Solid state	Liquid state	Gaseous state
1. Motion of molecules :	More free	.....
2. Intermolecular spaces :
3. Intermolecular forces :	Medium	.....
4. Volume :	Definite	.....	Indefinite
5. Shape :	Indefinite
6. Example :

4. A. Complete the following diagram which represents the changes of matter :



B. What happens when you ...?

Heat some water in a beaker to its boiling point.

1. A. Write the scientific term for each of the following :

1. The simplest pure form of matter which can't be analyzed chemically into simpler form. [.. ..]
2. A substance which is formed from combination of atoms of two or more different elements with constant weight ratios. [.. ..]
3. A molecule which is formed of similar atoms. [.. ..]
4. A compound which is formed of two hydrogen atoms and one oxygen atom. [.. ..]

B. Choose the odd word out, then write the scientific term for others :

1. Neon – Argon – Oxygen – Xenon.
2. Oxygen – Nitrogen – Water – Chlorine.
3. Ammonia – Water – Hydrogen chloride – Aluminium.

Odd word	Scientific term
1.
2.
3.

2. Choose the correct answer :

1. All of the following molecules are composed of one atom except
- a. argon. b. mercury. c. bromine. d. krypton.
2. Which of the following figures represents the molecule of hydrogen chloride ?



a.



b.



c.



d.

3. The molecule of ammonia consists of
- a. two atoms of two elements. b. two atoms of three elements.
- c. three atoms of three elements. d. four atoms of two elements.
4. All of the following are compounds molecules except
- a. water. b. ammonia.
- c. hydrogen chloride. d. fluorine.

Worksheets

5. All of the following are noble gases except

- a. hydrogen. b. neon. c. xenon. d. argon.

3. A. Put (✓) or (x), then correct the wrong one :

1. Oxygen element is a gaseous diatomic molecule.

()

2. The molecules of the same substance are different from each other.

()

3. Hydrogen chloride is an element, while sulphur is a compound.

()

4. The compound consists of combination of atoms of one element.

()

B. What is the difference between O_2 & O ?

O_2	O
.....
.....

4. A. Complete the following :

1. Hydrogen molecule is composed of atom(s), while argon molecule is composed of atom(s).

2. The liquid element which consists of one atom is, while that consists of two atoms is

3. Molecules of active gases are formed of atom(s), while molecules of inert gases are formed of atom(s).

B. Compare between element and compound concerning :

Definition – Atoms – Examples.

Points of comparison	Element	Compound
• Definition :
• Atoms :
• Examples :

1. Choose the correct answer :

- Matter can be distinguished from each other by their
 a. physical properties. b. chemical properties.
 c. biological properties. d. (a) & (b) are correct.
- All of the following are physical properties of matter except
 a. density. b. colour. c. taste. d. reaction with oxygen.
- The mass of the liquid is calculated from the relation.. ..
 a. density \times volume. b. $\frac{\text{density}}{\text{volume}}$ c. $\frac{\text{volume}}{\text{density}}$ d. no correct answer.
- The smallest part of matter which can exist freely is
 a. atom. b. compound. c. element. d. molecule.
- From the properties of the molecules of matter are
 a. in a state of a continuous motion.
 b. there are intermolecular spaces among them.
 c. there are intermolecular forces among them.
 d. all the previous answers.

2. A. Put (✓) or (x) , then correct the wrong one :

- Equal volumes of different substances have the same masses.
 ()
- Mass is the space that is occupied by the body.
 ()
- The intermolecular spaces bind the molecules of matter together.
 ()

B. What is meant by ... ?

- The mass :
- The molecule :

Worksheets

3. A. Complete the following :

1. Balloons are filled with or rise up in the air.
2. Alkaline solutions are of electricity , while solution of hydrogen chloride in benzene is a of electricity.
3. is the liquid element which is composed of one atom , while is the liquid element which is composed of two atoms.

B. Give reasons for :

1. Although sugar and table salt have the same shape and colour , we can differentiate between them easily.

2. Ammonia is a compound molecule.

4. A. What happens if you ... ?

Put a small quantity of potassium permanganate in a glass beaker containing water.

B. Explain how vaporization process occurs.

UNIT ONE

Lesson

3

Atomic Structure of Matter

Worksheet

8

1. A. Write the scientific term for each of the following :

1. An electrically neutral particle inside the nucleus of an atom. [.....
2. The number of positively protons in the nucleus. [.....
3. The fundamental building unit of matter. [.....
4. The sum of the numbers of protons and neutrons in the nucleus. [.....

B. Write the symbol of each of the following elements :

Element	Its symbol	Element	Its symbol
1. Copper	9. Nitrogen	.....
2. Chlorine	10. Silicon	.....
3. Aluminium	11. Silver	.....
4. Carbon	12. Iron	.....
5. Mercury	13. Gold	.....
6. Calcium	14. Potassium	.....
7. Sodium	15. Lead	.....
8. Magnesium	16. Zinc	.....

2. Give reasons for :

1. The nucleus of an atom is positively charged.

.....

.....

2. The mass number is usually greater than the atomic number.

.....

.....

3. The symbol of potassium is (K) not (Po) as it is expected.

.....

Worksheets

3. A. If the mass number of sodium atom is 23 and its atomic number is 11, so :

1. The number of protons is
2. The number of neutrons is

B. What happens when the number of protons changes ?

.....

.....

4. Mention the difference between :

1. Atomic number and mass number :

Atomic no.	Mass no.
.....
.....
.....
.....

2. Proton and electron :

Proton	Electron
.....
.....
.....

Worksheet 2

1. A. Give reasons for :

1. The electrons are distributed to fill (K) level before filling (L) level.

.....

2. The mass of the atom is concentrated in the nucleus.

.....

3. The atom is electrically neutral in its ordinary state.

.....

B. Write the symbol under each energy level to arrange them according to their positions from the nucleus, then mention which of them has the least energy and which of them has the highest energy ?

1. level has the least energy.
2. level has the highest energy.



1

2. A. Complete the following statements :

1. The electrons revolve around the nucleus at very, so they seem as around the nucleus.
2. The electrons orbit the nucleus in a number of shells called, each level has its
3. The maximum number of energy levels in the heaviest atoms is

B. Write the scientific term :

1. Negatively charged particles of negligible mass that revolve around the nucleus. [.....
2. The imaginary regions around the nucleus in which the electrons move according to their energies. [.....
3. The amount of energy lost or gained by an electron when it transfers from one energy level to another. [.....

3. What happens if ... ?

1. An electron gains a quantum of energy.
.....
2. The nucleus of an atom of an element doesn't contain neutrons.
.....
3. An excited electron loses a quantum of energy.
.....

Worksheet 10

1. Complete the following table :

Element symbol	Atomic no.	Mass no.	No. of protons	No. of electrons	No. of neutrons	Electronic configuration		
						K	L	M
$^{24}_{12}\text{Mg}$	...	24	.....	12	...	.....	.....	..
$^{12}_6\text{C}$	6	12	6	...	6	...	.....
$^{35}_{17}\text{Cl}$	17	...	17	17	.....	.....	.....	.....

2. A. Complete the following statements :

1. The energy level (K) is saturated with electrons, while the energy level (N) is saturated with electrons.

Worksheets

- The number of electrons which saturates the first four energy levels can be calculated from the relation
- The energy level "M" of aluminium atom ($^{27}_{13}\text{Al}$) contains electrons, while that of sulphur atom ($^{32}_{16}\text{S}$) contains electrons.

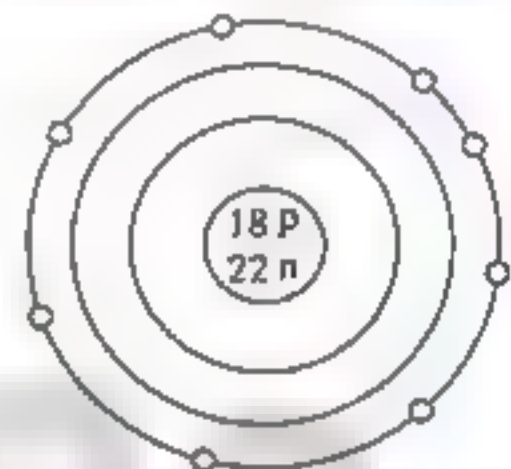
B. Give reasons for :

- Inert gases can't share in chemical reactions in ordinary state.

- The rule ($2n^2$) is not applied on the energy levels greater than four.

3. A. The opposite figure represents the electronic structure of an atom. Find :

- The atomic number :
- The mass number :
- The number of electrons :
- The number of neutrons :



B. Rewrite the following statements after correcting the underlined words :

- Hydrogen is the only inert gas which contains two electrons in the outermost energy level.
- Neon ($^{10}_{10}\text{Ne}$) is an active element, while nitrogen ($^{7}_{7}\text{N}$) is an inactive one.

4. A. Study the following figures, then answer the following questions :

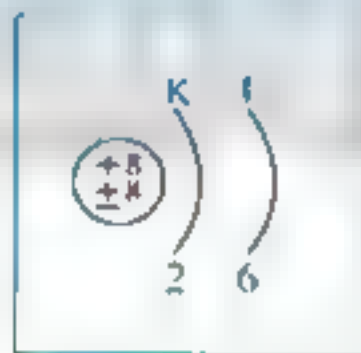


Fig. (A)



Fig. (B)

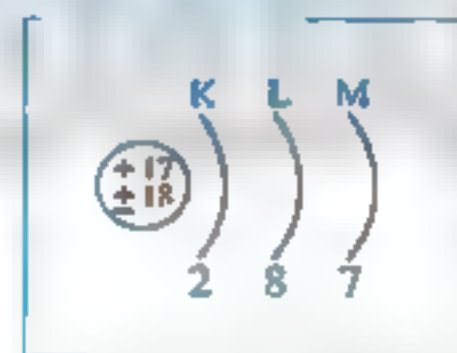


Fig. (C)

- What is the atomic number of each atom ?
- What is the mass number of each atom ?
- What is the number of electrons in the outer level of each atom ?
- Mention the number of energy levels having electrons in each atom.

B. Compare between active elements and inactive elements :

Points of comparison	Active elements	Inactive elements
• The electrons in the outer level :
• Chemical activity :
• Examples :

5. A. An element, whose electrons are distributed in three energy levels, and its outermost energy level carries 3 electrons and its atom contains 14 neutrons.

Answer the following questions :

1. Show by drawing the electronic distribution of the atom of this element.

2. Calculate the atomic and mass numbers of the atom of this element.

3. Is this element active or inert ?

- B An atom of an element doesn't take part in any chemical reaction and its electrons are distributed in three energy levels and its atom contains 22 neutrons. Calculate .

1. Atomic number.

2. Mass number.

General Exercise

on Unit ONE

Question

1

- A Choose a phrase from column (A) which may match another from column (B) :

(A)	(B)
1. Density measuring unit	a. atomic number.
2. Number of positive protons in the nucleus	b. cm^3
3. Substances that can conduct heat and electricity	c. mass number.
4. Mass measuring unit	d. copper and iron.
5. Total number of protons and neutrons	e. gm.
6. Bad conductors of heat and electricity	f. gm/cm^3
7. Volume measuring unit	g. wood and plastic.

- B Write down the scientific term expresses the following statements :

- The smallest particle of matter which can be freely existed and has the characteristics of its substance. [.. ..]
- The temperature at which a solid substance starts to change into a liquid one. [.. ..]
- A smallest particle can share in chemical reactions. [.. ..]
- Imaginary places in which electrons can move according to their energy. [.. ..]
- The simplest form of matter which can't be decomposed into a simpler one. [.. ..]

Question

2

Give reasons for :

1. It is difficult to bend an iron rod.

.....

.....

2. The third energy level in the atom is saturated by 18 electrons.

.....

.....

3. Some table salt disappears after a while when added to water without stirring.

.....

.....

PART

1

4. Atom is electrically neutral.

.....

.....

5. Substances have different chemical properties.

.....

.....

6. Inert gases can't share in chemical reactions in ordinary conditions.

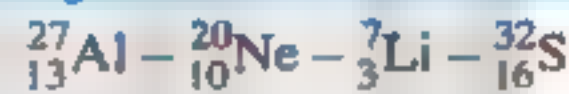
.....

.....

Question

3

A Write down the electronic configuration of the following atoms :



Then determine each of :

Atomic number · Number of neutrons – Mass number – Number of electrons.

Atom	Electronic configuration	Atomic no.	No. of neutrons	Mass no.	No. of electrons
${}_{13}^{27}\text{Al}$
${}_{10}^{20}\text{Ne}$
${}_3^7\text{Li}$
${}_{16}^{32}\text{S}$

B Write down the formula by which you can find each of the following :

1. Density :

2. The number of electrons that saturates the energy level of an atom :

.....

Model Exams

on Unit ONE

Model Exam

1

20

Answer the following questions :

Question

1

5 marks

A Complete the following :

1. The atom is the unit of matter.
2. The protons are found in the
3. Monoatomic means that the molecule is formed of
4. The rods used in building concrete houses are made up of

B Give reasons for :

1. Molecules of various substances are different from each other.

.....

.....

2. The atomic number of calcium atom equals 20

.....

.....

Question

2

5 marks

A What is meant by ... ?

1. The volume :
2. The density of aluminium equals 2.7 gm/cm^3

.....

B Put (✓) or (✗), then correct the wrong one :

1. The energy of level (N) is less than that of level (M).
()
2. The electron transfers from its energy level to a higher energy level when it loses a quantum of energy.
()
3. Aluminium is a very active metal.
()

21

1

4. Mercury is a liquid diatomic element.

()

Question

3

5 marks

A Complete the following table :

The molecule	Its type	Number and type of atoms
Water molecule :	..... (1) .....	..... (2)
..... (3)	Element molecule.	Two atoms of oxygen.
Hydrogen chloride molecule :	..... (4) .....	..... (5)
Ammonia molecule :	..... (6) .....	..... (7)

B What happens if ... ?

1. Three atoms of hydrogen combine with one atom of nitrogen.

.....

2. A substance reaches its boiling point.

.....

3. The mass number of an element equals its atomic number.

.....

Question

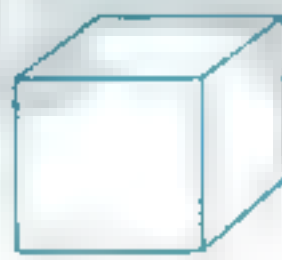
4

5 marks

A Arrange the following cubes ascendingly according to the density. Knowing that they have the same masses.



(1)



(2)



(3)

The arrangement :

B Mention one importance for :

1. Helium gas.

.....

2. Number of protons in the nucleus of the atom.

.....

Model Exam

2

20

Answer the following questions :

Question

1

5 marks

A Choose the odd word out, then write the scientific name for the rest :

1. Radon - Helium - Nitrogen - Argon.
2. Electron - Angstrom - Proton - Neutron.
3. Fluorine - Ammonia - Bromine - Carbon.

Odd word

Scientific name

1.
2.
3.

B Complete the following diagram :



....(1)

....(2) ...

Water

Water
vapour

... (4)

... (3)

Question

2

5 marks

A What is the mathematical relationship that bind the following ?

1. Density, volume and mass.

2. Number of protons, number of neutrons and mass number.

B Choose the correct answer :

1. The mass of the atom is concentrated in the
 a. protons. b. nucleus. c. neutrons. d. electrons.
2. The intermolecular force among the molecules of mercury is
 a. very large. b. relatively weak. c. vanished. d. very small.
3. All of the following atoms can take part in the formation of chemical compounds in ordinary conditions except atom.
 a. ^{17}Cl b. ^6C c. ^8O d. ^{10}Ne

PART

1

4. One gram of contains one type of atoms.

- a. iron
b. ammonia
c. hydrogen chloride
d. water

Question 3 5 marks

A Give reasons for :

1. In hydrogen atom, the atomic number equals the mass number.
.....
2. Electrons seem to be as a cloud around the nucleus during their movement.
.....

B Put (✓) or (×) :

1. The molecules of solid substances vibrate in a simple vibratory motion. ()
2. The outermost energy level of helium atom contains 8 electrons. ()
3. The element symbol is derived from its English name. ()
4. Helium and hydrogen are heavier than air. ()

Question 4 5 marks

A What happens if ... ?

1. A substance reaches its melting point.
.....
2. The atom gains a quantum of energy.
.....

B What is meant by ... ?

1. A drop of water is composed of millions of water molecules.
.....
.....
2. The atomic number of sodium atom is 11
.....

4. When the height of an object is doubled, its

- kinetic energy will be doubled.
- mechanical energy will be four times its value.
- potential energy will be doubled.
- potential energy will be three times its value.

B. Give reasons for :

1. Some countries try to use the Sun, wind and the movement of water in generating electricity.

.....

2. No changes in the potential energy when the object moves horizontally.

.....

4. A. Problems :

1. What is the weight of a body, whose potential energy is 66 joules and it is found at a height of 11 m from the Earth's surface ?

.....

2. If the work done to move a box a distance 5 metres equals 90 joules. Calculate the force.

.....

B. From the opposite figures :

Which figure represents doing work ? Why ?

.....



Fig. (1)



Fig. (2)

Worksheet 12

1. A. What is meant by ... ?

1. The kinetic energy of an object = 50 joules.

.....

2. The potential energy of an object = 30 joules.

.....

3. The mechanical energy of an object = 150 joules.

.....

Worksheets

B. Problems :

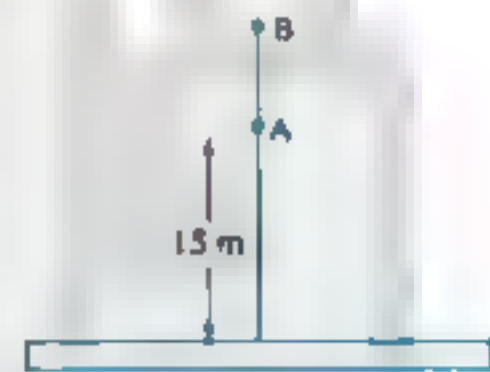
1. Calculate the mechanical energy of a body whose kinetic energy equals 1000 joules and potential energy equals 500 joules.

2. A ball was thrown up and when it reached 7 m, its speed was 8 m/sec. Calculate the potential energy, kinetic energy and the work done on it. If you know that the weight of the ball is 5 N and its mass is 0.5 kg.

3. In the given figure, if the sum of the potential energy and kinetic energy of an object of mass 5 kg. at point (B) is 900 joules.

Calculate its kinetic energy at point (A).

(acceleration due to gravity = 10 m/s^2)



2. A. Choose the correct answer :

1. When an object is thrown upwards, its
- a. speed increases gradually. b. speed decreases gradually.
- c. kinetic energy increases gradually. d. potential energy decreases gradually.
2. An object of mass 5 kg moves at a speed of 5 m/sec., its kinetic energy is joules.
- a. 62.5 b. 125 c. 12.5 d. 25

B. Put (✓) or (x) :

1. The kinetic energy of a moving body is directly proportional to its mass. ()
2. Potential energy = $\frac{1}{2} \times \text{Mass} \times (\text{Speed})^2$ ()

PART

1

3. What is the mathematical relation between :

1. Displacement, work and force.

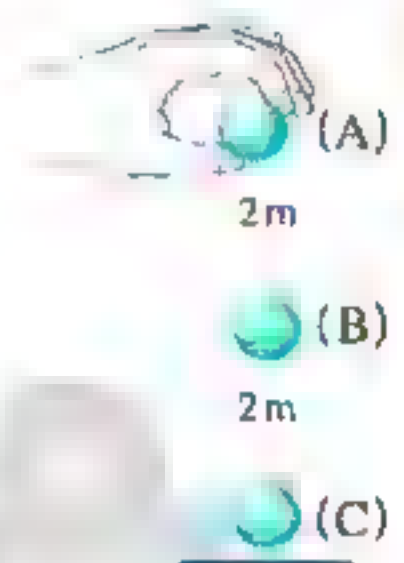
2. Weight, potential energy and height.

3. Kinetic energy, mass and speed.

4. Kinetic energy, mechanical energy and potential energy.

4. A. The opposite figure represents a falling of a ball from position (A) to position (C) through (B). Answer the following :

1. The potential energy is maximum at and it equals zero at
2. The kinetic energy is equal to potential energy at
3. The kinetic energy = at (A).
4. If the weight of the ball is 5 newtons, find its mechanical energy.

**B. Give a reason for :**

The kinetic energy will increase 4 times as the speed of the moving object is doubled.

UNIT TWO

Lesson

2

Energy Transformations

Worksheet

13

1. Explain an activity to prove the conservation of mechanical energy of a body.

.....

.....

.....

.....

.....

2. A. Complete the following statements :

1. In the simple cell, the energy changes into energy.
2. When you move the ball of the pendulum to the left, then release it, the energy changes into energy.
3. The positive pole in the simple cell is, while the negative pole is
4. When the speed of the ball of the pendulum is maximum, the energy is maximum, while energy is minimum.

B. From the opposite figure, answer the following questions :

1. What is the name of the opposite device ?

2. Label the fig. :

(1)

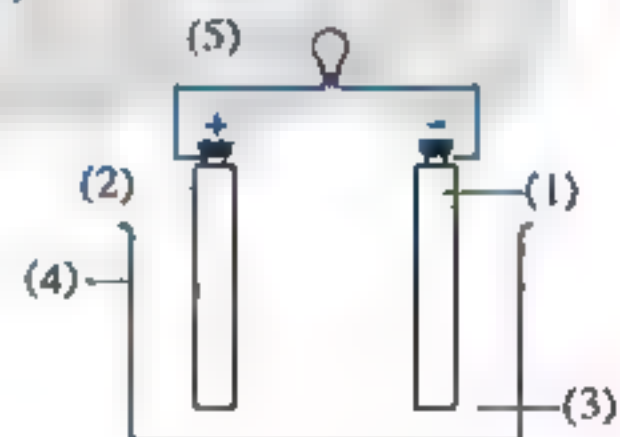
(2)

(3)

(4)

(5)

3. Mention the scientific idea of this device.



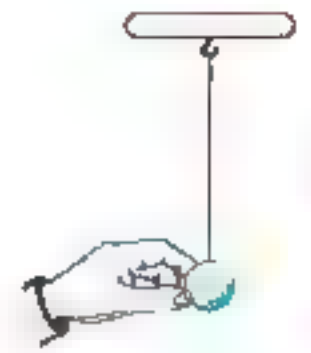
3. A. What happens ... ?

1. When two plates made of copper and zinc are dipped in dilute sulphuric acid and are connected by a wire and a small lamp.

.....

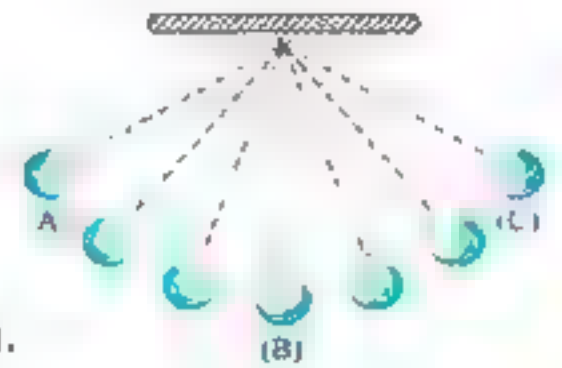
1

2. To the speed of the pendulum when you push it gently as shown in the figure.



B. Choose the correct answer :

- The mechanical energy of the ball of the pendulum at the highest point equals ...
 - its kinetic energy.
 - kinetic energy \times potential energy.
 - its potential energy.
 - zero.
- During moving a ball hanged in a thread as shown in the figure from left (A) to right (C), the
 - kinetic energy changes into potential energy only.
 - potential energy changes into kinetic energy only.
 - potential energy changes into kinetic energy and vice versa.
 - no correct answer.

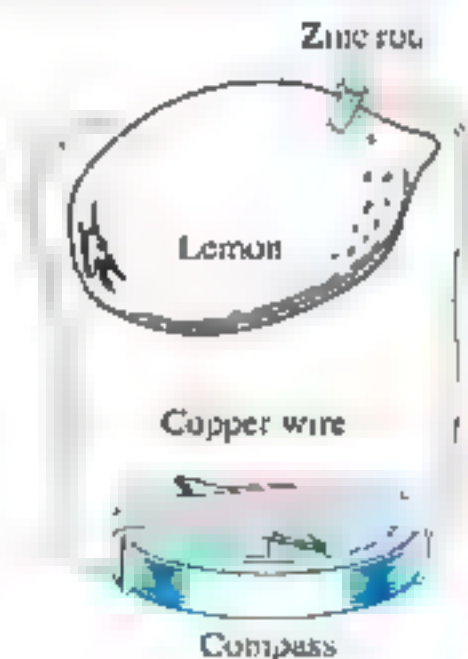


4. Problems :

- Someone kicked a ball of mass 0.5 kg and weight 5 N vertically upwards. At a height of 4 metres, its speed was 10 m/s. Calculate :
 - The potential energy at 4 metres.
.....
 - The work done on the ball at the starting point.
.....
 - The maximum height that the ball reached.
.....
- A ball is thrown vertically to reach 20 m height. If the weight of the ball is 5 newtons, calculate its kinetic energy at :
 - The highest point :
 - The ground :
 - The midpoint :

5. A. From the opposite figure :

- What happens to the compass ? Explain that.
.....
- What happens when a potato is used instead of the lemon ?
.....



Worksheets

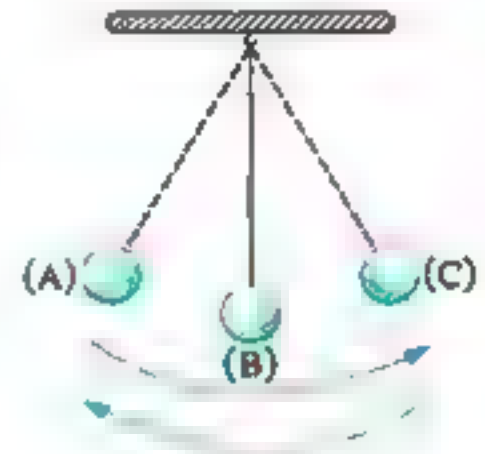
B. Give a reason for :

The motion of the children's swing is like that of the pendulum.

C. From the opposite figure, complete the following table :

[Knowing that the mechanical energy at point (A) = 150 joules and K.E. at point (B) = 100 joules].

Position	Kinetic energy	Potential energy
(A)
(B)
(C)



Worksheet 14

1. A. Give reasons for :

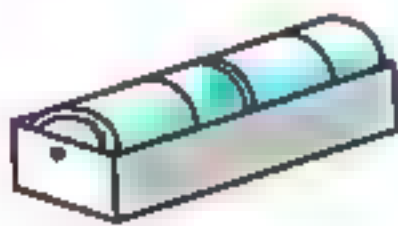
1. Technology has negative effects.

2. Ecologists do not appreciate all the technological applications which are used in energy transformations.

B. Use the following tools to construct an alarm electric circuit (with drawing) for :

1. A deaf person.

2. A blind person.



(1)



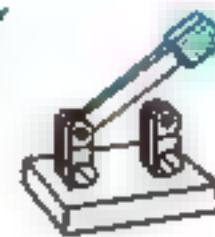
(2)



(3)







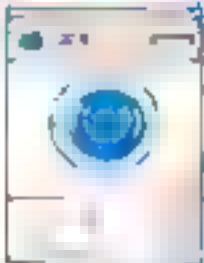
(4)



(5)

1

2. Complete the following table :

	The device	Energy used	Energy produced
1.		Electric	.....
2.		Sound
3.		Electric	.....
4.		Electric
5.		Electric	.....

3. Mention the harms which caused by each of the following :

1. Car exhaust :
2. Nuclear weapons :
3. Chemical pesticides :

4. A. Choose the correct answer :

1. In the cellular phone, the
 - a. electric energy changes into mechanical energy.
 - b. light energy changes into heat energy.
 - c. electric energy changes into sound and light energies.
 - d. chemical energy changes into light energy.
2. Chemical energy \longrightarrow Heat energy \longrightarrow Mechanical energy.
The sequence of energy changes shown in the diagram explains
 - a. a flashlight is on.
 - b. a candle burns.
 - c. fuel burns to power in a car.
 - d. the photosynthesis process.
3. The motor converts the electric energy into energy.
 - a. magnetic
 - b. chemical
 - c. light
 - d. kinetic

Worksheets

4. In the car engine, the chemical energy changes into energy at first.
a. heat b. electric c. mechanical d. light
5. The role of the technological applications is represented in
a. using energy resources and converting energy from one form to another.
b. creating energy from nothing. c. storing energy as its form is.
d. illustrating energy forms.

B. Write the scientific term :

1. Energy is neither created nor destroyed, but it is converted from one form to another. [.....]
2. The pollution produced from the waves of wireless transmitters of cellular phones. [.....]

Worksheet

15

on Lessons 1 & 2

1. Complete the following :

1. The measuring unit of energy is , while that of weight is
2. The kinetic energy of a moving body is directly proportional to its ... and
3. In electric bell energy is changed into energy.
4. When an object falls downwards, its energy converts into ... energy.

2. A. Choose the correct answer :

1. When you lift an object, you do work that is stored in the object in the form of
a. potential energy. b. kinetic energy.
c. mechanical energy. d. heat energy.
2. Kinetic energy increases by increasing
a. the mass of the object. b. the speed of the object.
c. the height from the ground. d. (a) and (b) are correct.
3. The simple cell contains
a. HCl b. HNO_3 c. H_2SO_4 d. NaCl

B. Give reasons for :

1. The work done to stop a moving car increases by increasing the mass of the car.

PART

1

2. When we use a potato instead of the lemon in the simple cell, the needle of the compass deflects.

3. A. Put (✓) or (x):

1. Force = $\frac{\text{Work}}{\text{Displacement}}$ ()
2. The developed countries aim to use the energy produced from fuel. ()
3. We use electric lamp as a tool for a deaf person. ()
4. Energy is created but not destroyed. ()
5. The potential energy of two identical objects at 5 m height have different values. ()

B. What happens when ... ?

1. Combustion of food in the human body.
2. An object moves horizontally [Concerning its potential energy].
3. Military explosions occur.

4. A. What is meant by the conservation law of energy ?

B. Mention :

1. The factors affecting the potential energy.
2. The factors affecting the kinetic energy.

UNIT TWO

Lesson

3

Heat Energy

Worksheet 16

1. A. Complete the following :

- Heat is transferred in three methods which are and
- The temperature when the kinetic energy of the particles increases and it is measured by the

B. From the opposite figure, answer the following questions :

- Heat will transfer from to
- The transfer of heat will stop when

60°C	40°C
(A)	(B)

C. Write the scientific term :

- A form of energy which is transferred from the object of higher temperature to that of lower temperature. [.. ...]
- The way by which the heat is transferred through copper or metallic wires. [.. ...]

2. Choose the correct answer :

- If you mix 10 ml water of 20°C with 10 ml tea of 80°C, the expected temperature of the mixture is
 a. 20°C b. 80°C c. 50°C d. 90°C
- On rubbing your hands, the
 a. heat energy is converted into sound energy.
 b. kinetic energy is converted into heat energy.
 c. heat energy is converted into kinetic energy.
 d. sound energy is converted into heat energy.
- The heat is transferred through solids by
 a. conduction and convection. b. radiation only.
 c. conduction and radiation. d. conduction only.

PART

1

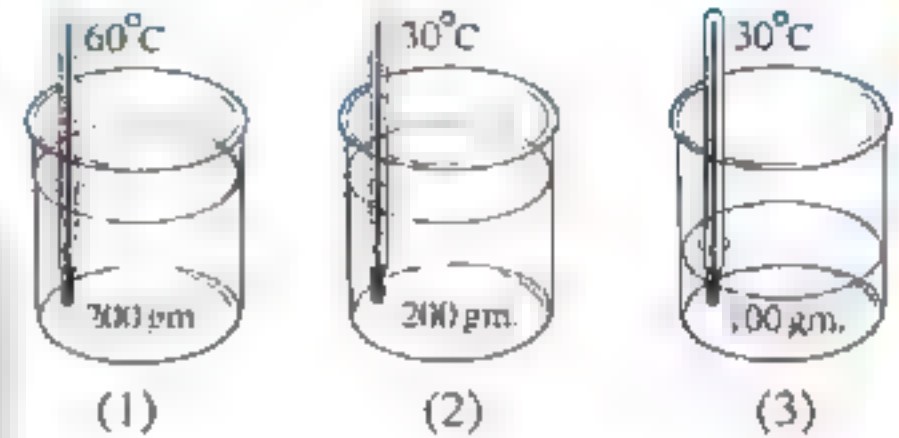
3. A. Give a reason for :

Cooking pans are made up of copper and aluminium.

B. Study the opposite figures, then answer the following :

1. In which beakers, the speed of water molecules are the same ? (Give a reason).

2. In which beaker, the kinetic energy of water molecules is higher than the others and why ?



4. What is meant by ... ?

1. Transfer of heat by conduction :
2. Temperature :

Worksheet 17

1. Give reasons for :

1. Heater is put at the bottom of the room.
2. The production of electricity from solar energy is preferred to burning of fuel.
3. The heat of the Sun is transferred to us by radiation.

4. Using solar heater is preferred to gas heater.

2. A. Choose the correct answer :

1. Heat is transferred by radiation through

- a. liquids only.
- b. gases only.
- c. metals only.
- d. material media and non-material ones.

2. _____ is a non-renewable resource of energy.

- a. Sun b. Electricity c. Petroleum d. Soil

3. The heat of the heater is transferred by

- a. conduction and radiation.
b. radiation and convection.
c. conduction and convection.
d. radiation only.

4. The Sun is

- a. a resource of permanent energy b. a resource of non-permanent energy.
c. not an energy resource. d. producing no energy.

B. Mention the method of heat transfer in each figure :



Fig. (1)

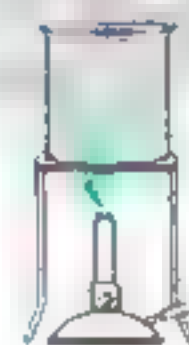


Fig. (2)

Liquid

3. A. Write the scientific term :

1. The way by which the heat is transferred through gases and liquids. [.]

2. The way by which the heat is transferred through gases and space

and it doesn't need a medium to transfer through. [. . .]

B. Complete the following statements :

1. _____ is a renewable resource of energy, while _____ is a non renewable resource of energy.
2. _____, _____, and _____ are from technological applications that produce heat energy.
3. Heat is transferred through gases by _____ and _____.

4. A. Give three examples illustrating that the solar energy is the origin of other forms of energy.

B. Mention the changes of energy in the following :

1. Solar oven : _____
2. Solar battery : _____

General Exercise of the School Book

on Unit TWO

Question

1

Choose the correct answer to complete the following statements :

- In the filament of electric lamp, the
 a. electric energy is converted into mechanical energy.
 b. light energy is converted into heat energy.
 c. electric energy is converted into heat energy.
 d. chemical energy is converted into light energy.
- When car lamps and radio cassette are on, there is a change inside the car battery from
 a. chemical energy into a light one.
 b. chemical energy into a sound one.
 c. chemical energy into an electric one.
 d. electric energy into a light one.
- In home when the gas stove is working, there is a change from
 a. heat energy into a chemical one.
 b. chemical energy into a heat one.
 c. chemical energy into a sound one.
 d. light energy into a heat one.
- As an object falls downwards,
 a. the potential energy increases.
 b. the kinetic energy increases.
 c. the mechanical energy is lost.
 d. the speed of the object decreases.
- As an object is launched upwards,
 a. its speed decreases.
 b. its speed increases.
 c. its kinetic energy increases gradually.
 d. its potential energy decreases gradually.
- In the simple pendulum, there is an energy transformation from
 a. mechanical energy into a sound one.
 b. mechanical energy into a light one.
 c. potential energy into a kinetic one and vice versa.
 d. kinetic energy into a heat one.
- Heat is transferred through solids by
 a. conduction and convection.
 b. radiation only.
 c. radiation and convection.
 d. conduction only.
- Heat transfers from a heater by
 a. conduction and radiation.
 b. radiation and convection.
 c. conduction and convection.
 d. radiation only.

PART

1

Question

2

What is meant by the following ... ?

1. Potential energy of an object is 20 joules.

.....

2. Mechanical energy of an object is 100 joules.

.....

3. Heat energy.

.....

.....

Question

3

Give reasons for :

1. The freezer is found at the top of fridge.

.....

.....

2. The heater is placed on the ground.

.....

.....

3. Fuel in a car is as food for a man.

.....

.....

4. Nuclear stations which produce electricity are preferred to those of petrol stations.

.....

.....

5. Ecologists do not appreciate all the technological applications which used in energy transformations.

.....

.....

Question 4

Name five of the technological applications which convert an energy form to another, then mention what the energy transformation in each application is.

.....

.....

.....

.....

.....

Question 5

A stone of 5 kg mass falls from 8 m height, what is its potential energy and what is its kinetic energy in each of the following ?

1. At the start of falling.

.....

.....

2. At a height of 2 m.

.....

.....

3. On reaching the ground (considering that the gravity acceleration = 10 m/s^2).

.....

.....

Question 6

Find the weight of an object of potential energy 88 joules when it is found at a height of 11 m.

.....

.....

Question 7

An object has a kinetic energy 64 joules and is moving at a speed of 4 m/s.

Find the object mass.

.....

.....

Model Exams

on Unit TWO

Model Exam

7

20

Answer the following questions :

Question

1

5 marks

A Choose the correct answer :

- is a form of energy which is transferred from an object with higher temperature to another object with lower temperature.
a. Potential energy b. Kinetic energy c. Heat energy d. Mechanical energy
- Heat transfers by
a. conduction. b. convection.
c. radiation. d. all of the previous answers.
- We can obtain the weight of a body from the relation
a. $\frac{\text{Potential energy}}{\text{Height}}$ b. potential energy \times Height.
c. potential energy + Height. d. no correct answer.
- causes chemical pollution for air which causes chest and eye diseases .
a. Nuclear weapons b. Loudspeakers c. Cellular phones d. Car exhaust
- The electric current in the simple cell passes from the
a. Positive copper plate to negative zinc plate.
b. Positive zinc plate to negative copper plate.
c. Negative zinc plate to positive copper plate.
d. Negative copper plate to positive zinc plate.

B Give reasons for :

- In the simple pendulum, the potential energy of a vibrating body increases as it goes away from its original position.
.....
.....
- We wear dark clothes in winter.
.....
.....

Worksheets

Question 2 5 marks

A Complete the following :

1. is the cause of wind movement which is used to generate electricity.
2. In sewing machine, energy changes into .. energy.
3. is a resource of energy , while is a form of energy.

B What happens if ... ?

1. You let hot spheres fall in a cold water.

2. There is no transfer of heat by radiation.

Question 3 5 marks

A Put (✓) or (x) , then correct what is wrong :

1. In photosynthesis process, the electric energy changes into chemical energy.

()

2. Loudspeakers cause massive destruction.

()

3. Food is from forms of energy.

()

B Choose the odd word out :

1. Sun / Wind / Food / Heat energy :

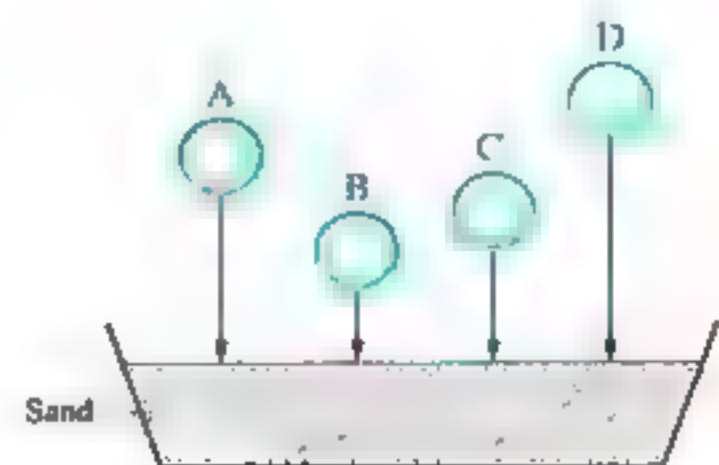
2. Weight / Height / Potential energy / Kinetic energy :

Question 4 5 marks

A In the opposite figure :

Arrange the four balls ascendingly according to the depth occurred by the balls when they dropped in sand , and give a reason for your answer.

(knowing that the balls are equal in masses)



PART

1

B Complete :

There are a lot of technological applications that produce heat, but they are different in :

1.
2.
3.

Model Exam

2

20

Answer the following questions :

Question

1

5 marks

A Put (✓) or (×) , then correct what is wrong :

1. Work = Force × Height.

()

2. In car dynamo a part of mechanical energy changes into potential energy.

()

B Give reasons for :

1. We wear light colours clothes in summer.

.....

2. Nuclear weapons are very dangerous.

.....

Question

2

5 marks

A Complete the following :

1. Heat is carried from the fire heater to our bodies by and

2. is the origin of most energies on the Earth's surface.

3. In nuclear reactor, energy changes into energy.

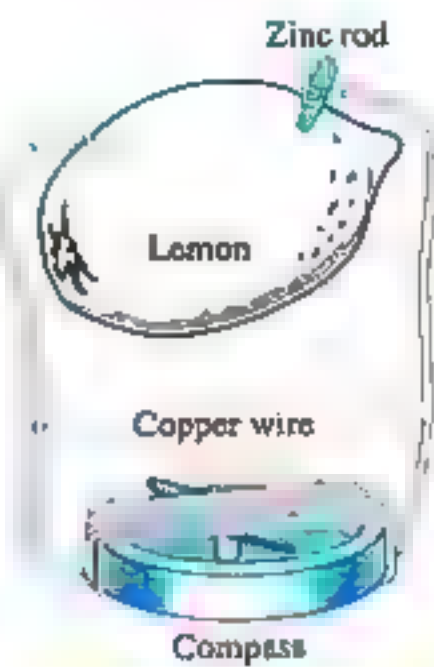
Worksheets

B In the opposite figure :

What happens ... ?

1. To the needle of the compass when we dip the copper wire into the lemon.
-

2. If we replace the zinc rod by a copper wire.
-

**Question****3**

5 marks

A Choose the correct answer :

1. All of the following are non-renewable resources of energy and pollute the environment except
- a. coal fire. b. gas oven. c. petrol stove. d. electric stove.
2. Electric energy changes into heat energy in the
- a. car dynamo. b. car engine. c. car air conditioner. d. car radio cassette.
3. In television energy changes into light and sound energies.
- a. nuclear b. electric c. radiant d. solar
4. The measuring unit of work is
- a. metre. b. second. c. newton. d. joule.
5. Mechanical energy is converted into heat energy by means of
- a. electric generator. b. electric heater. c. electric motor. d. friction among moving particles with each other.

B Explain :

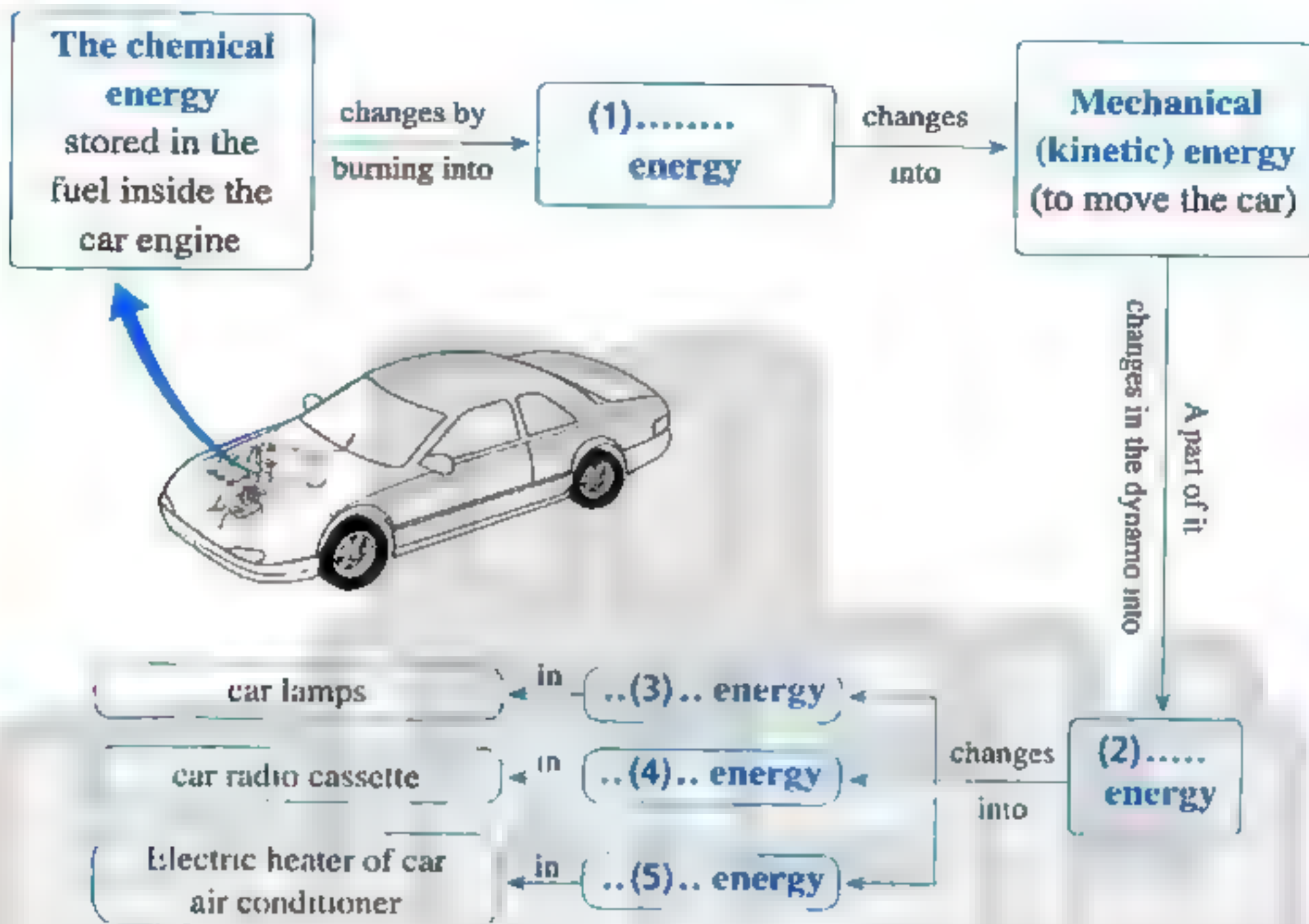
1. The Sun is the origin of most energies.
-

2. An activity to show the changes of energy in the electric lamp.
-
-
-

1

Question 4 5 marks

Complete the following figure :



UNIT THREE

Lesson

1

Living Organisms Diversity and Principles of their Classification

Worksheet 18

1. Complete the following sentences :

1., and are micro-organisms that live in water.
2. Plants may carry large-sized leaves as, or small-sized leaves as
3. dye is used in preparation of sample of stagnant water.

2. What do you expect in the following case ... ?

When you examine a drop of pond water under a microscope.

.....

3. Choose the correct answer :

1. All of the following are animals that live in water except ..
 a. fishes. b. lizards. c. hippopotami. d. crocodiles.
2. All of the following are unicellular organisms except ...
 a. amoeba. b. paramecium. c. rhinoceros. d. euglena.
3. are considered from small herbs.
 a. Camphor and palm b. Clover and gargeer
 c. Banana and clover d. Camphor and banana

4. A. Give reasons for :

1. Living organisms must be classified.

2. We can distinguish between banana plant and molukhiyah plant.

B. What is meant by micro-organisms ?

1. Mention one difference between each of the following :

1. Insects and arachnids :

.....

.....

2. Bean and maize plants :

.....

.....

2. Choose the correct answer :

1. is from animals with soft bodies.

- a. Snail b. Hedgehog c. Shrimp d. Jellyfish

2. Cycas plant belongs to

- a. angiosperms. b. brown algae. c. gymnosperms. d. ferns.

3. are considered from monocotyledon plants.

- a. Bean and pea b. Camphor and clover
c. Clover and gargeer d. Maize and wheat

4. The number of pairs of legs in scorpion is

- a. 3 b. 4 c. 44 d. 100

5. Pea plant belongs to plants.

- a. ferns b. dicotyledon c. terrestrial d. monocotyledon

6. All of the following are arthropods having three pairs of jointed legs except

- a. scolopendra. b. bees. c. locust. d. cockroaches.

3. A. Complete the following statements :

1. Flowering plants are classified into and plants.

2. is an example for plants that reproduce by formation of spores, but
is an example for plants that reproduce by formation of seeds inside cones.

B. Write the scientific term :

1. Plants which can't be distinguished into roots, stems and leaves. [.....]
2. They are small terrestrial plants reproduce by formation of spores. [.....]
3. Animals that their bodies have an internal support. [.....]

4. Mention the number of jointed legs in each of the following arthropods :

1. Julius :

Worksheets

2. Spider :

3. Fly :

5. A. Give an example for each of the following :

1. A dicotyledon plant :

2. An animal with an external support :

3. A plant that can be distinguished into roots, stems and leaves :

4. An animal with a soft body :

5. A plant from ferns :

B. Give reasons for :

Spider is not from insects.

.....
.....

Worksheet 20

1. A. Give reasons for :

1. The front teeth of hedgehog are extending outwards.

2. When a zebra mates a donkey, they can't produce fertile individuals.

B. Choose the odd word out, then write the scientific term for the others :

1. Ants – Mosquitoes – Spiders – Flies.

2. Amoeba – Euglena – Paramecium – Snake.

3. Octopus – Desert snail – Frog – Mussel.

Odd word	Scientific term
1.
2.
3.

2. Complete the following statements :

1. and, belong to **teethless mammals**.

2. is the basic unit of classification of living organisms.

3. Armadillo is one of the mammals, while hedgehog is one of the mammals.

PART

1

3. Define each of the following :

1. Species :

2. Taxonomy :

4. Mention the shape and the kind of teeth in each of the following organisms :

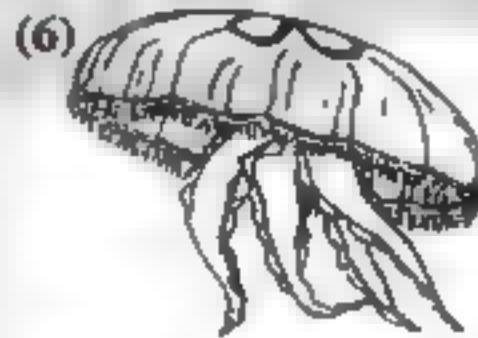
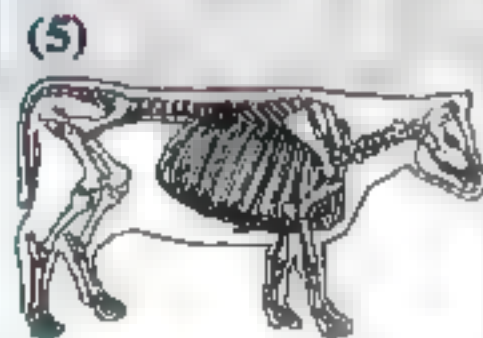
1. Rabbit :

2. Squirrel :

3. Hedgehog :

4. Tiger :

5. Write the names of the following living organisms, then classify them according to what you have studied :



UNIT THREE

Lesson

2

Adaptation and Diversity
of Living Organisms

Worksheet 21

1. A. Write the scientific term :

1. The ability of some body organs and tissues to do certain functions. [.....]
2. The adaptation in the activity of some birds in different times of the daylight. [.....]

B. Mention the causes of adaptation in animals :

.....

.....

2. A. Complete the following statements :

1. Types of adaptation are structural, and
2. Horse's limbs end in to run over rocky soil, whereas camel's limbs end in to walk on hot sandy soil.
3. The whale's front limbs are modified into to take the role of, whereas they are modified in the bat into to take the role of
4. Hawks have beaks to tear the prey's flesh, while ducks have beaks to help them filter their food from water.
5. Ducks and geese feed on and
6. and are examples of predatory birds which feed on

B. Choose the correct answer :

1. Secretion of sweat on rising human body temperature is adaptation.
a. functional b. anatomical c. behavioural d. structural
2. Which of the following is an example of behavioural adaptation ? ..
a. Camel's pad. b. Secretion of poison.
c. Birds migration. d. Secretion of sweat.
3. is (are) from the environmental changes that lead to adaptation.
a. Climate change b. Food diversity
c. Existence of water d. All the previous answers

4. Mammals move by all of the following ways except
- a. swimming. b. flying. c. absorption. d. running.
5. Number of anterior fingers of hawk is
- a. 3 b. 4 c. 2 d. one
6. The organs of birds that are adapted for feeding are the
- a. beaks and wings. b. legs and beaks.
- c. beaks and eyes. d. wings and eyes.
7. are from the birds that feed on shallow water worms and snails.
- a. Ducks and geese b. Heron and hoopoe
- c. Hawk and vultures d. All of the previous birds

3. A. What is meant by ... ?

1. Adaptation :
2. Anatomical adaptation :

B. Give reasons for :

1. The bones of the front limbs and fingers of monkey are elongated.
2. The two front limbs in the whale and dolphin are different from the two front limbs of bat although they are structured with similar bones.
3. Some birds have long thin beaks and long thin legs ending in thin toes.

4. A. What is the function of each of the following :

1. The palm legs in the geese :
2. The four fingers in vultures :

Worksheets

8. Use the figures (1 to 4) and the information in the chart below to write the number of the animal that best matches the correct way of motion :



(1)



(2)



(3)



(4)

Aiming to

Aiming to



Animal	(1)	(2)	(3)	(4)
Motion		

C. What are the results based on :

1. The variety of ways of movement in mammals.

.....

2. The variety of food for birds.

.....

Worksheet 22

1. Give reasons for :

1. Some plants pounce and digest insects.

.....

2. Some animals hibernate in winter.

.....

3. Some birds migrate in winter.

.....

4. Chameleon colours itself with the dominant colours in the environment.

.....

2. A. Choose the correct answer :

- All of the following are characteristics of predacious plants except
 a. they are autotrophic green plants. b. they absorb the nitrogenous substances.
 c. they can make photosynthesis process. d. they can make carbohydrates.
- is from the rodents that undergo aestivation.
 a. Desert snail b. Jerboa c. Squirrel d. Rat
- is/are considered from the animals that tend to hibernate.
 a. Frog b. Jerboa c. Snail d. (a), (b) and (c)
- bird migrates in winter.
 a. Quail b. Ostrich c. Duck d. Sparrow

B. What is the difference between hibernation and aestivation :

Hibernation	Aestivation
.....
.....
.....
.....

3. Complete the following statements :

- and are examples of insectivorous plants.
- In winter, frogs bury themselves in mud and that is called, while in summer, jerboa hides in humid burrows and that is called
- Birds migration is a adaptation.
- and are considered from the forms of adaptation in living organisms with the environmental changes.
- Desert animals avoid the effects of high temperature by hiding in humid
- and are examples of camouflage.

4. A. What is meant by camouflage. (Give an example).

.....

.....

B. What happens if stick insect or leaf insect settle on a white wall.

.....

.....

General Exercise of the School Book

on Unit THREE

Question

1

Complete the following sentences :

1. and are examples for micro-organisms that live in water.
2. The number of jerboa's upper jaw incisors is and their number in the rabbit's upper jaw is
3. Armadillo belongs to mammals and the hedgehog belongs to mammals.
4. is from the plants that reproduce by the formation of spores, whereas is from the plants that produce seeds inside cones.

Question

2

Choose the correct answer :

1. The number of the anterior fingers in a hawk is
a. 3 b. 4 c. 2 d. 1
2. belongs to the animals with no body support.
a. Octopus b. Mussel c. Hedgehog d. Snake
3. Pea plant belongs to plants.
a. ferns b. monocotyledon c. dicotyledon d. gymnosperm
4. is from the rodents that undergo aestivation.
a. Rat b. Squirrel c. Jerboa d. Desert snail

Question

3

Give one difference between each of the following :

1. Insects and arachnids.

.....

.....

2. Rodents and lagomorphs.

.....

.....

3. Bean plant and maize plant.

.....

.....

PART

1

Question 4

Give a reason for :

The individuals of the same species differ in some external characteristics.

.....

.....

Question 5

What do you expect in each of the following cases ... ?

1. Polar bear can't undergo hibernation.

.....

.....

2. The aestivated animals don't store their food in the form of fats.

.....

.....

3. The beaks of a hoopoe and a hawk are mutually exchanged.

.....

.....

4. Predatory plants can't capture insects for a long period of time.

.....

.....

Question 6

Give an example to show the adaptation of the following living organisms with the environmental conditions :

1. Duck :

2. Heron :

3. Hedgehog :

4. Dieonea plant :

Question 7

What are the results based on the following ... ?

1. The variety of the ways of motion in mammals.

.....

2. Increasing the well known species of living organisms.

.....

Model Exams

on Unit THREE

Model Exam

1

20

Answer the following questions :

Question 1 5 marks

A Complete the following :

1. is the behaviour that some animals do by hiding in humid burrows in winter.
2. is an example of functional adaptation.
3. , and are examples of angiosperms.

B What happens if ... ?

Chameleon goes to sandy area.

Question 2 5 marks

A Choose the correct answer :

1. All of the following are forms of adaptation except
 a. hibernation. b. aestivation. c. birds migration. d. extinction.
2. is from autotrophic insectivorous plants.
 a. Drosera b. Elodea c. Palm d. Adiantum
3. The front limbs of are modified into wings.
 a. horse b. monkey c. bat d. dolphin

B Give a reason for :

Desert snail is an example of behavioural adaptation.

Question 3 5 marks

A Correct the underlined word :

1. Amoeba is an example of multi-cellular organisms. (.....)

PART

1

2. **Species** is a branch of biology that searches for the similarities and differences among living organisms. (.....)

3. Long thin beaks in heron is an example of **functional adaptation**. (.....)

B Explain : Dieonea plant is autotrophic insectivorous plant.

.....

.....

Question 4 5 marks

A What is meant by ... ?

1. Autotrophic plants.

.....

.....

2. Functional adaptation.

.....

.....

B What does these numbers indicate :

1. 4 pairs of jointed legs.

.....

2. 3 pairs of jointed legs.

.....

Model Exam

2

20

Answer the following questions :

Question 1 5 marks

A Choose the correct answer :

1. Some animals are characterized by the presence of an internal and an external support as

a. fish.

b. snail.

c. mussel.

d. aquatic turtle.

2. is an example of insects.

a. Bee

b. Scorpion

c. Julius

d. Spider

B What happens if ... ?

1. Vougheir can't produce spores.

.....

2. Mating between a zebra and a donkey.

.....

Question 2 5 marks**A Complete the following :**

1. We use dye to examine a drop of a stagnant water.

2. and are examples of myriapods.

B Choose the odd word out :

1. Leaf insect - Stick insect - Chameleon - Elodea plant. (.....)

2. Dinosaur - Desert snail - Jerboa - Frog. (.....)

3. Shrimp - Mussel - Snail - Fish. (.....)

Question 3 5 marks**A What is meant by ... ?**

1. Insectivorous plants.

.....

.....

2. Rabbit is from lagomorphs.

.....

.....

B Write a short note about the adaptation in insectivorous plants.**Question 4 5 marks**

Explain an activity to examine a drop of a stagnant pond water.

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